THE IRON TRADE REVIEW

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PRICE CUTTING

IS BECOMING A MORE IMPORTANT FACTOR.

Car and Rail Orders Placed — Some Mills Report Slight Improvement Over December Orders and Specifications.

Some mills report an increase in specifications against contracts in January as compared with December, the increase being largely in the heavier products, but improvement comes very slowly, and there is cutting on all products except rails, although quotations are fairly well maintained on tubes. More general cutting in sheets has been a development of the past two or three weeks. There has been no formal discussion as to ore prices, but it is probable that last year's quotations will prevail. Three blast furnaces are now in operation at Gary, with a capacity of 13,500 tons per month each. The Steel Corporation has slightly more than 57 per cent of its blast furnace capacity in operation. The pig iron production of the country for January was almost exactly the same as for December.

Pig Iron Conditions

An interesting development in pig iron is the action of the valley makers of basic in deciding to compile the average monthly selling price of their product to be used as a basis for sliding scale contracts for various materials. The average selling price of Bessemer pig iron has long been the usual standard of settlement on contracts of this kind. The pig iron markets are very dull, and in some sections there is a tendency toward weakness, especially in the south, where lower prices seem to be inevitable unless the melt should show a good increase. In the Cincinnati district, scrap dealers and other speculators have on hand about 25,000 tons of pig iron. This fact is a menace to the strength of the market, which up to date has been pretty well maintained by the furnaces.

Railroad Buying

The principal railroad order for the week was 2,200 steel cars for the Pennsylvania lines west of Pittsburg, and the Chesapeake & Ohio also ordered 500 cars. Of the Pennsylvania order, the Cambria Steel Co. will build 1,000 cars; the American Car & Foundry Co., 600 cars; the Pressed Steel Car Co., 500, and the Standard Steel Car Co., 100 cars. The Chicago & Northwestern has ordered 20,000 tons of Bessemer steel rails and 10,000 tons of open-hearth rails; the Rock Island has ordered 28,000 tons of Bessemer rails; the Tooelee Valley railroad will take 5,000 tons of rails from the Colorado Fuel & Iron Co., and the Pennsylvania Steel Co. has been awarded the contract for 7,200 tons for canal work.

Plates and Steel Bars

Some mills report increased specifications on steel bars. There is apparently less cutting on bars than on most other products. In plates conditions are unsatisfactory, and the cutting is from $1 to $2 per ton. One important interest reports a steady increase in orders for heavy materials, some of which will be exported. The City of Mexico will have a letting on March 10 on 12,000 tons of cast iron pipe, principally four to 36-inch.

Coke and Old Material

The old material market has experienced further declines in nearly all centers, and very little business is being transacted. The coke market is possibly a shade stronger, but some very low prices are still being made for prompt delivery on both furnace and foundry grades.

GOOD SHOWING

MADE LAST YEAR IN IRON AND STEEL EXPORTS,

Considering Industrial Conditions—Little, if Any, Dumping—Tonnage Exports for Eleven Years.

Iron and steel exports in the calendar year 1908 made a very good showing, considering the conditions in the international steel market. The tonnage exports showed a decrease from 1907 of only 25.94 per cent, and from 1906 of 27.27 per cent, while the total value, this including the various items of machinery, hardware, etc., the weight of which is not returned, decreased only 23.32 per cent from 1907 and 12.43 per cent from 1906. As 1906 was easily the record year, the showing is excellent. There is a decrease, but it is small compared with the decrease in the domestic demand.

A measure of the domestic demand in the past three years may be found by adding to domestic proluction of pig iron an estimate of the imports in terms of the pig iron actually involved, and subtracting a similar estimate of the exports. By this means the following presentation is reached of domestic demand, in terms of pig iron, taking no account of stocks:

1906	24,450,000
1907	25,000,000
1908	15,000,000

It is an incident that the computation brings out figures so nearly even. The 1908 domestic consumption is 40 per cent less than that in 1907 and 38.7 per cent less than that in 1906. The foreign business thus fell off much less than the domestic. Tonnage exports of the United Kingdom fell off 20.4 per cent from 1907 to 1908, our own decrease being 25.9 per cent. Our decrease was somewhat greater, but that is doubtless due to our relative newness in the export business.

Dumping Not Practiced.

There was practically no dumping involved in the 1908 exports. The American iron and steel trade appears

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THE WEEK IN IRON CENTERS

PITTSBURG.

Some Progress Being Made in Spite of Disappointment.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., Feb. 2.

Viewed from the standpoint of present sentiment, the month of January has proved a distinct disappointment in the iron and steel industry. The gain in mill orders which was confidently expected to come early after the beginning of the new year, has not made its appearance. On the contrary, the aggregate volume of entries made upon mill books by some steel companies has shown a decrease. Generally, however, the situation may be stated that while no forward motion of the industry is to be noted, none of the past improvement has been lost and the less hopeful tone characterizing the market seems to have resulted from the failure of actual conditions to measure up to anticipations.

The past month has not been without its progressive features. The heavier lines, such as rails and semi-finished steel, upon which the mills count for tonnage, have displayed more activity and substantial increases of output have been made. This has resulted in part from the prompt manner in which the Pennsylvania railroad has specified against its recent rail contract and by a heavier consumption by the miscellaneous users of light and standard rails, billets and sheet bars. Although there is a backwardness to the final closing of rail contracts by the steam lines, the buying of steel cars continues, the Pennsylvania lines west having awarded during the past week 2,200, and the Chesapeake & Ohio 500 cars.

The disturbing factors in the market continue the current shading of finished material prices by some independent interests, which is apparently increasing, and the doubt engendered in the minds of buyers as to the extent of the revision of the tariff and its consequent effect upon the market.

Of interest, as reflecting the steadily-growing consumption of basic pig iron in steel making, is the action of the valley makers of this grade of iron, in uniting in the compilation of an average monthly selling price of their product, to be used as the basis for sliding scale contracts for various materials. At the present time, the average selling price of Bessemer iron is the standard of settlement most frequently adopted, but recently some coke contracts have been made at a fixed ratio of the market price of basic iron.

Pig Iron.—An interesting development in the pig iron market is the determination of valley makers of basic pig iron to co-operate in compiling an average monthly price from the transactions of magnitude made in this grade to be used as a basis for sliding scale contracts for other materials. With the steadily increasing consumption of basic iron in recent years, there has arisen among certain interests a greater disposition to make it the basing standard in business deals of this sort along with Bessemer iron which has been quite generally used for this purpose. No association similar to the Bessemer Pig Iron Association has been formed, but the makers have agreed to join in lending assistance in this work. The first compilation for the month of January showed an average of $15.50 valley or $16.40 Pittsburg. The average Bessemer price for the same month was $16.44 valley or $17.34 Pittsburg, compared with $16.50 valley or $17.40 Pittsburg in December.

The pig iron market is dull and prices are weaker. The true extent of this sagging tendency remains undetermined however, as there are but few small transactions upon which to base calculations and some of these have been in resale iron. A local foundryman took 300 tons of what is reported to have been No. 2 foundry at $15 valley or $15.90 delivered. The market is quoted at from $15 to $15.50 valley, most furnaces asking this latter figure. A machine company closed for from 300 to 400 tons of southern iron, high in silicon and phosphorus and for delivery this quarter, at about $17.70 delivered or $12.80 Birmingham.

A lot of 100 tons of Bessemer for eastern delivery was taken at $16.50 valley in competition with other valley makers, the consumer desiring iron from that territory. Malleable is held around $15.50 valley which is likewise the present level for basic.

The furnace of the Ohio Iron & Steel Co., Lowellville, has been blown out.

For prompt and first quarter shipment on northern iron, we quote as follows:

Bessemer, valley	$16.35 to 16.50
Bessemer, Pittsburg	17.25 to 17.40
No. 2 foundry, Pittsburg	15.90 to 16.40
Gray forge, Pittsburg	15.25 to 15.50
Basic, valley	15.50 to 15.75
Basic, Pittsburg	16.40 to 16.90

Ferro-Alloys.—Consumers of ferro-alloys are well covered on their requirements over the first quarter and beyond, and are expressing their needs in occasional small inquiries. Prices are largely nominal, although tending downward, and we quote 80 per cent ferro-manganese at $44 to $45 seaboard with a freight rate of $1.95 to Pittsburg.

Imported 50 per cent ferro-silicon is quoted at $62.50 to $63 Pittsburg on forward deliveries; domestic 12 per cent, $27; 11 per cent, $26; 10 per cent, $25 Pittsburg.

Plates.—The Pennsylvania lines west during the week placed orders for 2,200 steel freight cars. The awards made were 1,000 coke cars to the Cambria Steel Co., 600 gondolas to the American Car & Foundry Co., 500 stock cars to the Pressed Steel Car Co. and 100 flat cars to the Standard Steel Car Co. The plates and shapes required for these cars, about 15,000 tons, will be supplied by the Cambria Steel Co., Carnegie Steel Co. and Jones & Laughlin Steel Co., the material for the order of the Cambria company being about 12,000 tons. It is officially confirmed that the Chesapeake & Ohio has ordered 500 all-steel hopper cars of 100,000 pounds capacity from the Standard Steel Car Co., and the plates, about 6,000 tons, will be furnished by the Carnegie Steel Co. In addition to the orders recently placed, the New York Central lines are figuring upon 1,000 steel underframe box cars, and the Western Maryland inquiry for 900 cars is still pending. The steel car companies in this district are preparing to increase their operations, and the mills are being benefited by the specifications for material required by the car orders recently placed. The Wm. Cramp & Sons Ship & Engine Building Co. has placed with eastern mills, 7,500 tons for a collier freighter for the United States government. Shading of plate prices is being done. We quote officially as follows:

Tank plate, ¼-inch thick, 6¼ to 100 inches, 1.60c, f. o. b. mill Pittsburg. Extras are as follows per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox

steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—Owing to the current underselling of the official market on sheets, the situation is unsatisfactory from the standpoint of some makers, who are maintaining prices. There is only a fair amount of business being offered, but competition for it, particularly among the independents, is spirited. A number of the independents including such makers as Follansbee Bros. Co., Whitaker-Glessner Co., Youngstown Iron & Steel Roofing Co., Empire Sheet & Steel Co., American Rolling Mill Co. and others, are running their full sheet capacity. The largest maker has 93 mills or 50 per cent of capacity in operation, which is the same record as last week. We quote officially as follows:

Blue annealed sheets, No. 10 and heavier, 1.80c; Nos. 11 and 12, 1.85c; Nos. 13 and 14, 1.90c; Nos. 15 and 16, 2c; box annealed, Nos. 17 to 21, 2.25c; Nos. 22 to 24, 2.30c; Nos. 25 and 26, 2.35c; No. 27, 2.40c; No. 28, 2.40c; No. 29, 2.60c; No. 30, 2.70c; galvanized sheets, Nos. 10 and 11, 2.45c; Nos. 12 and 14, 2.55c; Nos. 15 and 16, 2.65c; Nos. 17 and 21, 2.80c; Nos. 22 and 24, 2.95c; Nos. 25 and 26, 3.15c; No. 27, 3.35c; No. 28, 3.55c; No. 29, 3.70c; No. 30, 2.95c; corrugated roofing, $1.75 per square for No 28 painted, 2½-inch corrugation, and $3.10 per square on galvanized roofing, 2½-inch corrugation, No. 28.

Jobbers are allowed $1 a ton from these prices.

Tin Plates.—Starting Feb. 1, active shipments of tin plate to the fish packers of the Pacific coast are under way. The delivery movement this year is several weeks later than normally, but the indications are that in tonnage it will compare very favorably with other years. The tin mills in anticipation of these shipments have been running actively and have been piling stock. The general shading of prices prevalent in the iron and steel market is also applying to tin plate, and concessions are being made by some interests. The American Sheet & Tin Plate Co. continues to have 164 mills or 68 per cent of capacity on the active list. We quote official prices as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.70 f. o. b. mill Pittsburg district. Terms, 30 days, less 2 per cent for cash in 10 days.

Rails and Track Material.—The rail situation from the standpoint of the Carnegie Steel Co. shows improvement, the tonnage specified during January having been the largest in about a year's time. The Pennsylvania Railroad Co. is regularly specifying against its recent contract, orders having just been filed with the mills for the February deliveries. An increase of the original tonnage contracted for by this line would not be unexpected. Inquiries for standard sections are more plentiful from the railroads, manufacturers, and miscellaneous sources. There is a better demand for light rails, the lumber companies particularly showing greater needs. The domestic bookings of the past week reached 2,600 tons, which is about the highest attained in this line for a number of months. The prices named by the rerolling mills are being met by the makers rolling from billets. The demand for track fastenings is good. On present specifications on Bessemer rails we quote as follows, the base price for open-hearth rails being $30 mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $32; 12-pound, $29; 16-pound, $27; 20-pound, $26; 25 to 45-pound, $25; angle splice bars for standard sections, $1.65; standard spikes, $1.70 to $1.80 Pittsburg; hand spikes, $1.80 to $1.90 Pittsburg.

Steel.—Specifications against billet and sheet bar contracts showed some increase with certain makers during January. The forges are enjoying favorable operations and their billet orders are in accordance. New business in billets is light, and some makers are reluctant to take on such contracts except for immediate shipment. There is some contracting in sheet bars.

Bessemer and open-hearth billets, base sizes, are quoted at $25 Pittsburg, and forging billets at $27 Pittsburg, subject to the division of the freight charge over $1 and not exceeding $2, and sheet and tin bars at $27.50 Pittsburg, valley and Wheeling territory, and $27 Pittsburg for delivery to other points.

Hoops and Bands.—There is no evidence of improvement in hoops. Little contracting is under way and specifications are only fair. There is considerable shading of prices in this market. The West Leechburg Steel Co., having recently added a new hoop mill, is now taking orders. Official prices are as follows:

Hoops in carload lots, 1.80c; in less than carload lots, 1.90c; bands, 1.40c, base half extras as per standard steel.

Merchant Bars.—The month of January in steel bars showed no decline in the volume of specifications over December, and some companies report slight gains. The jobbing trade is ordering its bars only as consumers are buying, and is carrying no stocks. Specifications from the harvester interests are good. There is apparently less shading of price in steel bars than in some other products. The bar iron situation shows little change and prices in this territory are holding fairly uniform. Shafting is reasonably steady. We quote officially:

Common iron bars, 1.50c Pittsburg in carload lots and over; 1.55c in less than carloads, 1.32c to 1.35c base Pittsburg, plus freight to point of shipment on western deliveries; Bessemer and open-hearth steel bars, 1.40c; plow and cultivator, 1.40c; channels, angles, zees, tees, under 3-inch 1.50c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 57 per cent in carloads, and 52 per cent in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. Planished and machine straightened tire steel is 1.60c base. Iron finished tire under 1½ by 1½ inches, 1.55c, plus ½ extra on tire card; iron finished tire, 1½ by ½ and over, 1.40c, plus ½ extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100 inch and thicker, we quote base prices for 100 pounds, $3.35 on hard, and $3.60 on soft.

Structural Material.—The aggressive competition for work among some fabricators with the consequent low prices from those interests which are apparently obtaining their plain material at concessions, continues to mark the situation. There is considerable work in prospect for the coming building season, but dissatisfaction is expressed over the irregularity of prices. Work upon clearing the site for the main structure of the

25-story Oliver business building in this city has been inaugurated, and the ground is to be completely in the hands of the contractors by April 1. The steel work, about 10,000 tons, which will be furnished by the American Bridge Co., will be started at once. The indications are that the Equitable insurance building in New York, which will take about 25,000 tons, will go ahead this season. The American Bridge Co. will furnish the 1,250 tons required for the grandstand at the new park of the Pittsburg baseball club of the National league. A new warehouse, to be erected in this city by J. B. Booth & Co., will require about 150 tons. Bids have been taken by the West Penn Steel Co. for its new plant at Brackenridge, Pa., 1,000 tons, and the contract is expected to be placed very shortly. Bids will go in this week on the West Penn hospital in this city, which will take about 1,200 tons. The plans for the Wilkinsburg, Pa., high school have been re-drawn to bring the structure within the appropriation, and the steel, 300 tons, is about to be re-figured. We quote official prices as follows:

Beams and channels, 15-inch and under, 1.60c; over 15 inches, 1.70c; zees, 1.60c; tees, 1.65c; angles from 3 to 6 inches, 1.60c; over 6 inches, 1.70c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

Merchant Pipe.—The demand for merchant pipe is being maintained at a steady gait, and makers are viewing the situation with some degree of satisfaction. The outlook for the future of the market is quite promising. The National Tube Co.'s operations are upon about the same basis as they have been for the past month. A local light and heat company is in the market for 10,500 feet of 5-inch line pipe. We quote the following official base discounts subject to five off to jobbers, while a few of the very large jobbers with mill connections are given an additional one point off:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
¾ to 6 inches....	75	65	73	63

Boiler Tubes.—A better demand for locomotive tubes is noted, showing some improvement in conditions among the railroads and locomotive builders. The merchant trade continues dull. We quote the following official discounts to the general trade on base sizes:

BOILER TUBES.

	Iron.	Steel.
2¼ to 5 inches.....	52	65

Wire Products.—The progress of the market in wire products is not up to expectations, although the present season is ordinarily a quiet one. Contracts on wire and nails are being fairly well specified against, but new obligations are limited. The jobbing trade continues to hold stocks to the minimum. We quote official prices as follows:

Wire nails, jobbers' carload lots, $1.95; retailers' carload lots, $2; painted barb wire, jobbers' carload lots, $2.10; retailers' carload lots, $2.15, with 30c for galvanizing; plain wire to jobbers in carloads, 1.80c and to retailers in carloads, 1.85c.

Wire Rods.—New bookings in rods are few, the main activity being in specifications against contracts which are of fair volume. We quote $33 Pittsburg on Bessemer and $34 Pittsburg on open-hearth rods.

Coke.—Although the weakness in spot coke prices continues, the tendency of the market is apparently toward firmer conditions. Considerable of the coke on track in the Connellsville regions is being absorbed, and the efforts to curtail production continue, several of the smaller independents having shut down entirely or decreased their number of active ovens during the past week. Many of the independent operators are holding firm to their idea of $1.75 ovens for spot furnace coke, and this is giving a firmer tone to the situation, although small accumulations of stock coke are being offered considerably under this level. Some improvement in the demand for foundry coke is noted, and the few new contracts being placed are around quoted figures. We quote the spot market on high grade furnace coke at from $1.60 to $1.70 ovens, and on contract from $1.90 to $2 ovens. On first class Connellsville foundry coke for immediate shipment the price range is from $2 to $2.25 ovens, and on contract from $2.25 to $2.50 ovens. The *Courier's* figures for the week ending Jan. 23 show 23,598 active ovens, with an output of 267,709 tons, compared with 23,478 active ovens with an output of 262,440 tons the preceding week.

Old Material.—Increasing weakness is being shown in old material by the limited business that is being transacted. Present buying is confined largely to current offerings from the producers of scrap, as the dealers are showing no marked willingness to move at present prices, their heavy stocks accumulated during the past six months. The embargo on turnings and borings at the plant of the Allegheny Steel Co., at Brackenridge, Pa., was removed this week, but these grades continue to sag. We quote gross tons delivered in the Pittsburg district as follows:

Heavy melting scrap, $15.75 to $16.25; re-rolling rails, $17 to $17.50; bundled sheet scrap, $13 to $13.50; iron axles, $22 to $23; old iron rails, $18.50 to $19; No. 1 wrought scrap, $17.25 to $17.50; old car wheels, $16.50 to $17; low phosphorus, $18.50 to $19; machine shop turnings, $11.50 to $12; cast borings, $9.50 to $10; No. 1 cast scrap $14.50 to $15; malleable, $15 to $15.50.

NEW YORK.

Pig Iron Selling Light, but Furnaces Firm in Their Quotations.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Feb. 2.

Pig Iron.—Conditions show little change from those of a week ago. Selling is still light, being principally confined to small lots for early shipment, but the situation continues strong and concessions are few and far between. Frequent instances are to be found where business has been refused by furnace interests rather than shade the prices at which they had been holding. There has been some further buying by cast iron pipe interests, which have taken several thousand tons, though exact figures are impossible owing to the fact that much of this business consists of chance lots picked up here and there and is not competitive. The Central Foundry Co. is understood to have purchased some 8,000 tons of northern iron, chiefly of the lower grades, for first and second quarter delivery, but no other large sales have come to light. Furnace interests manifest no intention of blowing in more stacks for the present, although several are in condition for operation. January business in this territory was generally light, with the exception that one large selling interest closed contracts for about 50,000 tons of various irons. We quote, New York tidewater, first half delivery, as follows:

Northern foundry No. 1.....	$17.25 to 17.75
No. 2X foundry.....	17.00 to 17.25
No. 2 plain	16.50 to 17.00
No. 2 southern foundry.....	17.25 to 17.75
Malleable	18.00 to 18.50
Basic	17.00 to 17.25
Gray forge	16.25 to 16.75

Ferro-Alloys.—There is a fair volume of inquiry for both ferro-manganese and ferro-silicon, and several sales of the former have been made. The Inland Steel Co. took 500 tons for rather advanced delivery at a

price slightly under $44.50, seaboard, which is about the figure at which most current selling is being done. Ferro-silicon is quiet at $62 to $63, Pittsburg.

Finished Materials.—Only a few structural orders have been closed during the week, and their aggregate tonnage is not important. Local contracts include 500 tons for street railway barns, taken by the Passaic Steel Co.; 600 tons for the Powell candy factory, taken by J. B. & J. M. Cornell; 300 tons for an ice plant, placed with the Hinkle Iron Works; and 300 tons for a Newark school building, taken by an independent interest. Two San Francisco jobs aggregating 500 tons went to Milliken Bros., who have also secured a 500-ton contract for work at the Northampton, Pa., plant of the Atlas Cement Co. James Stewart has the general contract for the Roberts, Johnson & Rand factory at St. Louis, 1,100 tons. The American Bridge Co. has taken a 200-ton highway bridge in Montana and perhaps 400 tons for a baseball grandstand at Pittsburg. Bookings of this interest for January were in the neighborhood of 20,000 tons, against at least 30,000 tons taken by independent interests. Few new building projects are developing. The Northwestern is in the market for 400 tons of steel for track elevation work at Chicago, and bids have gone in for 1,500 tons for the Elk Street viaduct at Buffalo. The New York Metal Ceiling Co. is to erect a factory building.

Some definite action on at least a part of the rail inquiry now pending is expected within a week or two, but it is not anticipated that the tonnages will be heavy in proportion to those of normal years. A good business is noted in frogs, switches and other railroad accessories.

Cast iron pipe is quiet and brisk competition for the limited business going is keeping prices down. Prospective business seems to be chiefly in the West, although Webster, N. Y., is to receive bids up to Feb. 20 for a water works system requiring about six miles of pipe, and Albion, N. Y., will install a large plant a little later on. Bar iron is weaker in sympathy with the scrap decline, and can now be had at 1.45c to 1.50c, New York. We quote: Angles, 2 to 6 inches x ¼-inch and heavier, 1.76c; beams, 3 to 15 inches, 1.76c; tees, 3 x ¼-inch and heavier, 1.81c; plates, carloads, tanks, 1.76c; marine boilers, 2.16c; bar iron, 1.45c to 1.50c; soft steel bars, 1.56c; sheets, No. 28, black, 2.66c.

Old Materials.—Trading is light, being confined to small lots offering here and there, generally under pressure. Heavy steel is down to $16, delivered at eastern Pennsylvania plants, and several important melters are offering only $15.75. The decline has affected other lines of scrap and the entire situation is weaker, otherwise the market is featureless. There is an embargo on the two large Coatesville plants. We quote, gross tons, New York delivery, as follows:

Old steel rails (re-rolling)	$14.50 to 15.00
Relaying rails	21.50 to 22.00
Old car wheels	14.00 to 14.50
Old iron car axles	19.00 to 20.00
Old steel car axles	18.50 to 19.00
Heavy melting steel	13.50 to 14.00
No. 1 railroad wrought	16.00 to 16.50
Iron track scrap	14.50 to 15.00
Wrought pipe	12.50 to 13.00
Cast borings	9.00 to 9.50
Wrought turnings	10.00 to 10.50
Heavy cast scrap	13.50 to 14.00
Railroad malleable	12.50 to 13.00
Stove plate	10.00 to 10.50
Grate bars	10.50 to 11.00

CLEVELAND.

Ore Prices Will Probably Not be Changed—Some Inquiry for Pig Iron.

Office of THE IRON TRADE REVIEW,
Browning Building, Feb. 2.

Iron Ore.—Furnace men are showing very little interest, but some have made reservations for their ore supply. No actual orders have, however, been reported. No formal discussion has yet taken place in regard to ore prices, but the prevailing opinion is that they will be the same as last year.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.50.

Pig Iron.—An inquiry for 6,000 to 9,000 tons of basic is pending; the local branch of the leading pipe interest is inquiring for 4,000 tons; a Mansfield interest is in the market for 4,000 tons, and some other inquiries are pending, but for the most part the market is very dull, and there is a tendency toward weakness in prices. For local delivery, Cleveland furnaces are now asking $16.50, but practically no sales are being made.

No. 1 foundry	$ 17.00
No. 2 foundry	16.50
No. 3 foundry	16.00
No. 2 southern	17.35
Gray forge	14.75
Bessemer	17.00 to 17.25
Lake Superior charcoal	19.50
Jackson Co. 8 per cent silvery	20.00

Coke.—If there is any change in the market, it is for the better, but spot coke is still very weak. Standard foundry coke on contracts we quote at $2.25 to $2.40, and $1.85 on furnace coke on contracts. For prompt delivery we quote furnace coke $1.50 to $1.60, and foundry at $2 to $2.15.

Finished Material.—Interest centers in the contract about to be awarded for the material for the No. 1 stack which Corrigan, McKinney & Co. will build in this city. Building projects which it is expected will soon be contracted for include the Brotherhood of Locomotive Engineers' building, the Cleveland Athletic Club's new home, and the structure which the Bailey Co. will erect for the Higbee Co., on Euclid avenue. Although the improvement is very slow, specifications are fair, and one mill agent states that his business for January was the best in 15 months. Jobbers report January business slightly in excess of that for December. Reports of cutting on plates, sheets and structural material are still current.

Old Material.—Another sag in the market prices has been noted this week, 50 cents a ton being cut off the prices of heavy steel, No. 1 railroad wrought, borings and turnings. Little stock is being moved, local mills still being out of the market for quantity. Quotations are as follows, f. o. b. Cleveland.

Old iron rails	$18.50 to 19.00
Old steel rails (re-rolling)	16.50 to 17.00
Old steel rails (under 6 ft.)	16.50 to 17.00
Old car wheels	16.00 to 16.50
Old steel boiler plate	13.50 to 14.00
Malleable iron (railroad)	15.00 to 15.50
Steel axles	20.00 to 20.50
Malleable iron (agricultural)	13.50 to 14.00
Heavy steel	14.50 to 15.00
Country mixed steel	13.50 to 14.00
Low phosphorus	17.00 to 17.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$15.00 to 15.50
No. 1 busheling	13.00 to 13.50
No. 1 machine cast	13.50 to 14.00
Iron axles	19.00 to 19.50
Axle turnings	10.50 to 11.00
Machine shop turnings	9.00 to 9.50
Grate bars	12.00 to 12.50
Pipes and flues	12.50 to 13.00
Tank iron	12.50 to 13.00
Hoop and band iron	9.25 to 9.75
Sheet iron	8.50 to 9.00
Wrought drillings	9.00 to 9.50
Stove plate	12.50 to 13.00
Cast borings	8.00 to 8.50

CINCINNATI.

Market is Dull and Tone Weaker—Little Change in Prices.

Office of THE IRON TRADE REVIEW,
First National Bank Bldg., Feb. 2.

Pig Iron.—The market continues sluggish. The only inquiry that has developed worthy of mention is that of a northern Ohio manufacturer asking for 1,500 tons of No. 1 and No. 2 foundry for second quarter

delivery or a total of 4,000 tons, 2,500 of which will be taken in the third and fourth quarters of the year. The local inquiry for 1,500 tons of analysis iron is still pending. An eastern pipe maker bought 500 tons of southern iron and an Indiana melter bought about 600 tons of southern iron. A sale to a local foundryman of from 300 to 500 tons of southern iron at $12 Birmingham for No. 3 foundry has been reported, but the transaction is credited with having been re-sale iron, as the southern furnaces are apparently maintaining $13 Birmingham for No. 2 foundry. It is nevertheless true that the market is weaker in tone and that consumers have been advised that odd lots were available at slightly under current prices and that northern as well as southern iron might be had in this way. The market is, however, not quotably changed, but the lack of demand and the continued requests to hold up shipments have a depressing influence on the situation. It is a'so noticeable that the number of unfilled orders is decreasing, as some contracts have been completed, and this is leaving the sales agencies as well as the furnaces with less business on the books in the way of unfilled orders. The speculative iron bought on the buying movement last November is said to be still in the hands of the investors to a considerable extent. In spite of these conditions, the attitude of furnaces remains unchanged in the north as well as in the south. We quote for prompt delivery and for first half of the year delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton as follows:

Southern foundry No. 1	$16.75 to 17.25
Southern foundry No. 2	16.25 to 16.75
Southern foundry No. 3	15.75 to 16.25
Southern foundry No. 4	15.25 to 15.75
Southern No. 1 soft	16.75 to 17.25
Southern No. 2 soft	16.25 to 16.75
Southern gray forge	14.75 to 15.25
Northern No. 1 foundry	17.20 to 17.70
Northern No. 2 foundry	16.70 to 17.20
Northern No. 3 foundry	16.20 to 16.70
Northern 8 per cent silicon	19.70

Finished Material.—Specifications on contracts have been fair and noticeably good by agricultural interests. The store trade has been rather dull but prices from stock are unchanged.

Coke.—The situation is unchanged and prompt shipment coke is easy with rather free offerings. There is but little doing in contracts. The following quotations represent the range of prices in the leading coke producing districts—the inside figures indicating what may be done on prompt shipment coke while the outside figures are contract prices:

	PER TON.
Wise county furnace coke	$1.75 to 1.90
Wise county foundry coke	2.10 to 2.30
Pocahontas furnace coke	1.85 to 2.00
Pocahontas foundry coke	2.00 to 2.25
Standard Connellsville furnace coke	1.50 to 2.00
Standard Connellsville foundry coke	2.00 to 2.50

Old Material.—The market is unsettled and weak. It is difficult to locate prices as current figures while not quotably lower could probably be shaded. Dealers' prices here are as follows:

Old No. 1 R. R. wrought, net tons	$14.50 to 15.00
No. 1 machinery, net tons	13.00 to 13.50
Old iron rails, gross tons	18.00 to 18.50
Old steel rails (re-rolling) gross tons	16.00 to 16.50
Old short lengths, gross tons	16.00 to 16.50
Old iron axles, net tons	17.00 to 18.00
Heavy melting scrap, gross tons	14.00 to 14.50
Stove plate, net tons	11.00 to 11.50
Heavy turnings	9.50 to 10.00
Cast borings, net tons	6.00 to 7.00
Car wheels, gross tons	15.00 to 15.50

The office of M. E. McKee, manager of sales at Cincinnati for the Republic Iron & Steel Co., moved on Feb. 1 into a new suite of offices at 1303 First National Bank building.

PHILADELPHIA.

Better Outlook in Pig Iron and Finished Lines—Scrap Lower.

Feb. 2.

Pig Iron.—The local market has assumed a slightly more favorable tone, and there are already predictions that a good buying movement will develop before the close of the current month. Sales during the past week have been small, the largest lots being above 1,000 tons, but there is a decidedly better run of small orders and the testimony of traveling iron salesmen is that the melt is showing a moderate increase, particularly with the specialty foundries. Activity is almost entirely confined to foundry iron, on which prices are being well maintained, one sales agency reporting that on an offer 25 cents under the market it was unable to place a lot of 500 tons. Basic is quiet, but a new inquiry is current, involving perhaps 10,000 tons for rather advanced delivery. There appears to be little accumulation of iron in this territory, as the disposition is not to blow in additional capacity until it is certain to find a ready market. We quote, Eastern Pennsylvania delivery for prompt and first half, as follows:

No. 1X foundry	$17.50 to 18.00
No. 2X foundry	17.00 to 17.50
No. 2 plain	16.50 to 17.00
Standard gray forge	16.00 to 16.50
Basic	16.75 to 17.25
Low phosphorus	21.50 to 21.75
No. 2 Birmingham	17.75 to 18.25
No. 2X Virginia	17.50 to 18.00
No. 2 plain Virginia	17.00 to 17.50

Finished Materials.—With the prospect that the Baltimore & Ohio tonnage will develop within a few days, and the closing during the past week of some rather important contracts for rails and equipment, the railroad situation is decidedly more favorable. The Pennsylvania order of 2,200 steel freight cars for its lines west of Pittsburg is divided as follows: Cambria Steel Co., 1,000; Pressed Steel Car Co., 500; American Car & Fdy. Co., 600; Standard Steel Car Co., 100. The Pennsylvania Steel Co. has secured the contract for 7,200 tons of 70-pound sections for canal work. Orders have also been closed for good quantities of angle bars, spikes, tie plates, frogs, switches, etc., for canal service, and a better demand is noted generally in these lines. The railroad interests negotiating for rails, however, are not expected to close for heavy tonnages, as the mills are in such shape that additional purchases can be made with the certainty of fairly prompt delivery.

Three good projects involving handsome tonnages are pending in this district and give every indication of resulting in business at an early date. The Cramps are figuring on between 7,000 and 9,000 tons of shapes and plates for collier work. The Union League club addition has been slightly revised, but will probably be let within the week. The bidding on the Baltimore tobacco warehouse, 1,000 tons, closes Tuesday. The Jones & Laughlin Steel Co. secured some 500 tons of bars and plates for government work on the canal and at various navy yards, and the Penn Steel Co. took the federal prison at Leavenworth, Kas., 600 tons.

Prices seem to be maintained to a greater extent than is generally supposed, and we quote as follows: Structurals, 1.75c to 1.90c; plates, 1.75c to 1.80c; refined bar iron, 1.50c to 1.60c; steel bars, 1.55c.

Old Materials.—The week has been featured by a further sharp decline in heavy melting steel carrying down with it all other lines in which there has been much activity. One local interest has picked up 1,000 tons of No. 1 heavy steel at $16.25 delivered, and is now out of the market for some weeks. Another large consumer is offering $15.75, but is not securing much material. An embargo was placed on the Lukens plant at Coatesville Tuesday. Rolling mill scrap is extremely dull, there being practically no demand, while a market for steel scrap can be found if prices are made low enough. The rapid decline in the market has served to bring out the extent to which the high prices had

forced large consumers to substitute iron in their melt. We quote, gross tons, delivered at eastern Pennsylvania plants, as follows:

Old steel rails (re-rolling)	$17.50 to 18.00
No. 1 steel scrap	16.50 to 17.00
Old steel axles	20.00 to 21.00
Old iron axles	22.50 to 23.00
Old iron rails	20.00 to 21.00
Old car wheels	16.00 to 16.50
Choice scrap R. R. No. 1 wrought	19.00 to 19.50
No. 1 yard scrap	16.75 to 17.25
Machinery scrap	16.00 to 16.50
Low phosphorus scrap	20.00 to 20.50
Wrought iron pipe	15.75 to 16.25
No. 1 forge fire scrap	15.00 to 15.50
No. 2 forge fire scrap, ordinary	10.00 to 10.50
Wrought turnings	13.00 to 13.50
Axle turnings, heavy	15.00 to 15.50
Cast borings	12.00 to 12.50
Stove plates	13.00 to 13.50

ST. LOUIS.

Inquiries for Pig Iron are Numerous —Dull Last Week.

Feb. 1.

Pig Iron.—Last week marked very little improvement in the St. Louis territory in the way of orders for pig iron, but inquiries in the mails this morning show a decided increase over last week. There were approximately as many inquiries and orders in the mails Monday as were received the whole of last week. The market is firm at $13, Birmingham, for No. 2, so far as the furnaces are concerned. Some of the trade in the St. Louis territory insists that it has been offered No. 2 at $12.75, Birmingham, but this probably is re-sale iron and for prompt shipment. Some of the furnaces are quoting $13 to $13.25 for No. 2 for delivery over the first half of the year. Ohio foundry iron is firm at $15.50 to $16, Ironton, for No. 2. Our quotations delivered, to which the freight of $3.75 from Birmingham has been added, follow:

No. 1 southern	$17.25 to 17.75
No. 2 southern	16.75 to 17.25
No. 3 southern	16.25 to 16.75
No. 4 southern	15.75 to 16.25

Coke.—The coke market is firm at $2.25 to $2.50 ovens for the best selected 72-hour Connellsville foundry coke for shipment over the first half of the year. Spot foundry coke is offered at from $2 to $2.25 ovens. The quotation on 48-hour Connellsville furnace coke, ovens, is $1.50 to $1.75 for prompt shipment, and from $1.75 to $2 for future delivery. Virginia and West Virginia foundry coke is held at $2.40 to $2.50 for immediate and future delivery, and furnace grades at $1.75 to $2. The freight rate to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia and West Virginia fields when shipment is destined beyond St. Louis.

Old Material.—The market is practically unchanged from last report, with quotations as follows:

Cast iron borings, free from foreign material, net tons	$ 6.00
Steel axle turnings, gross tons	12.50
Steel railroad axles, net ton	17.50 to 18.50
Iron railroad axles, net ton	19.00 to 20.00
Miscellaneous steel scrap, gross ton	12.50 to 13.50
Old car wheels, gross ton	16.00
No. 1 railroad cast scrap, net ton	12.00 to 12.50
Heavy machinery cast, net ton	13.00 to 14.00
Stove plate and light cast, net ton	11.50
Sheet iron, net tons, uncut	5.00
No. 1 railroad wrought, net ton	13.00 to 13.50
Railroad malleable, net ton	12.00 to 12.50
Heavy melting steel, net ton	13.00 to 13.50
Relaying rails, net ton	17.00 to 18.00

BUFFALO.

Pig Iron Dull, With a Tendency Toward Weakness.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, Feb. 2.

Pig Iron.—There is little change in local market conditions, except a slight tendency toward weakness, but the prices given below are a fair estimate of the quotations now being made by the furnaces in this district. The dull tone of the market here, although slight in character, seems to be due to indifference on the part of certain consumers and the fact that quite a number of foundries are not operating at capacity. The Buffalo foundries are making more headway now than those of other cities in this territory. There has been some selling this week at prices a little below the quotations given. We quote, f. o. b. Buffalo, as follows:

No. 1 X foundry	$16.75 to $17.25
No. 2 X foundry	16.25 to 16.75
No. 2, plain	15.75 to 16.25
No. 3	15.50 to 15.75
Malleable Bessemer	17.00 to 17.50
Gray forge	15.25 to 15.50
Charcoal	20.50 to 21.00

Finished Products.—Specifications continue coming along in fair number, although a falling off in this respect is generally reported. There are, however, a number of prospective orders and this business will enter the market soon. The Onondago Hotel Co., of Syracuse, will want, it is estimated, 1,200 tons of fabricated structural material, and the specifications for this tonnage will likely be out in two or three weeks. The Spargo Wire Cloth Co., of Rome, N. Y., is in the market for 100 tons of structural and bids will go in Feb. 26. Bids went in today on the tonnage required for the proposed building of the Dold Packing Co. The last closing of interest here was the Washburn-Crosby Milling Co.'s order for 600 tons of structural, to be used for the new mill to be erected here. The machinery equipment will amount to about $200,000. Other lines are reported dull.

SEATTLE.

Steady Advance in Demand—Spot Pig Iron Scarce.

Office of THE IRON TRADE REVIEW,
302 Pioneer Bldg., Jan. 30.

A quiet, steady advance has characterized the iron market of the Pacific northwest during the past month. The sentiment is much more rosy than it was at the opening of the year and, what is better than sentiment, the actual volume of business is steadily increasing. There have been no spectacular advances and general conditions are very sound. The unusually severe weather which caused a temporary lull two weeks ago has moderated and traffic conditions, except in the locality of Stockton, Cal., have been restored to normal. The local rolling mills are all running and the output has increased slightly. The Irondale Steel Co. has placed an order for its two open-hearth furnaces, cranes, boilers, etc., amounting to about $300,000, with The Moran Co., Seattle. The contract stipulates that the furnaces shall be completed by June 1. The Washington Steel & Bolt Co. reports a good business in bolts, nuts, rivets, etc., and states that it is enlarging its plant to take care of increased business.

Wire products are very active; sales of steel cable are good and several orders for 5,000 and 6,000-foot lengths for logging purposes have been booked. Owing to the recent advance in freight and a consequent general advance of $1 a ton on all standard wire products, the tonnage for January has not equalled that of December, although the January sales have been 15 per cent heavier than was anticipated.

The structural market is quiet and there is little contracting either for bridges or buildings. The only important tonnage in sight is for the proposed Trustee building in Portland; this building is to be about 200 feet on a side, 10 stories high, of a combination steel and reinforced concrete construction that will require about 1,100 tons of structural material.

Although the foundries are still quiet, business is noticeably better than on Jan. 1. The contract for 95 ornamental lamp posts for Second avenue, Seattle, has been awarded to the Olympic foundry, Seattle, at $36 a ton.

Pig Iron.—The north coast is on the verge of a famine in spot pig iron. Improved demand from the

foundries, coupled with severe weather which has delayed expected cargoes from Europe and domestic iron from Alabama, has reduced the available supply to an unprecedentedly low point. About 200 tons, some of it Cleveland No. 3, at Tacoma, is all that is available in western Washington. Stocks at Spokane are also low; the Portland situation is not so strained on account of a heavy tonnage held by a large cast iron pipe interest. The demand for iron to arrive in May continues to be satisfactory, and prices are strong with $24.50 the ruling price for Cleveland No. 1. We quote in gross tons:

English, Cleveland No. 3 spot	$25.50 to 26.00
Glengarnock, No. 1 spot	28.00 to 29.00
English soft, No. 1, to arrive April-May	24.00 to 24.50
Southern soft, No. 2	26.70 to 27.20

Old Material.—Better foundry conditions have caused more activity in the sales of foundry and machinery scrap; the foundries, realizing that there is little prospect of lower quotations, are buying with more freedom. Prices are firm. We quote in net tons, f. o. b. Seattle:

Foundry and machinery scrap	$17.50 to 19.00
Old steel rails	8.00 to 9.50
Railroad wrought	10.00 to 11.00
Country wrought and busheling	5.50 to 8.00

Merchant Iron.—The return of normal weather with its consequent improvement in traffic conditions has placed the bar iron market on a more normal footing than was found two weeks ago. The element of price is still causing hesitancy and until the matter is settled definitely, a perfectly free movement of steel and iron bars cannot be expected on the north coast. While most other lines have advanced in conformity with the increase in freight charges, there has been no change in bar prices up to date. A sentiment prevails that these prices may not be advanced for some time and this has a tendency to retard the placing of orders for future consumption that would be issued should an advance be imminent. We continue to quote base prices per 100 pounds f. o. b. Seattle, common iron bars, $2.25; mild steel bars, $2.35; machinery steel, $2.75; Norway iron, $3.50; angles, channels, zees and tees, under 3 inches, $2.75.

BIRMINGHAM, ALA.

Confident Feeling That Business Will Soon Improve.

Feb. 1.

Hope pervades the entire southern territory as to pig iron. The producers are confident that there is going to be an immediate improvement in general conditions and that the demand is going to take on a change at once. Summing up the transactions of the first month of the year, it is asserted here that the aggregate business equalled the production. There was no effort made to increase the output in the least, though three or four furnaces are ready for the torch or nearly so. One furnace at Ensley (Tennessee company), has been blown out, but another iron maker has taken its place. Other companies have furnaces nearing completion also.

While some concession was made during the past month, all furnace companies now in the southern territory are demanding $13 per ton, No. 2 foundry, firmly for the product and this price will be the lowest price at least for this month. A better quotation is looked for.

It is announced that H. F. DeBardeleben, general manager of the Woodstock Iron Co. (Anniston), who recently resigned, will join his father in the Birmingham district (Acton basin coal mines), and participate in some exceptional developments planned. J. M. Barr, president of the Woodstock company, will move to Anniston at once and take up the work heretofore done by Mr. DeBardeleben.

W. T. Nolan has the contract for building an addition to the soil pipe plant of the Bessemer Soil Pipe Co., at Bessemer. N. O. Nelson, of St. Louis, is president of the company. It is announced that large improvements are intended at this industry, the contract just let being but part of the general plans.

BRITISH IRON MARKET

Sensitive to American Reports—Some Speculation.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Jan. 23.

The Middlesbrough market has shown a little sign of recovery this week, inasmuch as prices have moved up by about 3d. Today's quotation is 48s 9d ($11.94) for No. 3, and warrants 48s 8d ($11.92). A rather more encouraging sign is that the rapid pace with which stocks were being increased has been slightly arrested, and on one day there was a slight decrease. The amount now in store stands at 150,604 tons. The market is extremely sensitive to American reports, and has suffered slightly because cables have not been quite so cheerful of late. The shipments of pig iron are the poorest for a long time. Up to three days ago, the tonnage was 42,795 tons since the beginning of January, compared with 53,431 tons up to the same date last month. There are fewer vessels loading in the Tees than for a long time past. Trade is being affected by the miserable continental demand. In the Midland district, prices tend to stiffen somewhat, the makers being in a strong position, with bookings well through the first quarter. In Northampton and Derbyshire, there is an excellent demand for machinery castings, mainly for Lancashire cotton machinery. Other foundry demand is rather dull. A good deal of the pig iron buying is speculative, through the comparatively poor demand for finished products. In the hematite trade, business remains slow, but prices are firmly maintained. East Coast mixed numbers realizing 56s ($13.70) for prompt delivery and 6d more for deliveries during next quarter. The hematite trade seems likely to benefit slightly from the practical withdrawal of continental competition in billets, which has enabled the big steel works to quote their billets about half a crown more, and in some cases it is said the increase has been obtained.

The quarterly meeting was very well attended and although no great amount of business was done, the tone was altogether hopeful. Welsh tinplaters, who were present in large numbers, are well off for orders, and looking forward to a good year, especially in American trade.

CHICAGO.

Slight Improvement in Pig Iron—Two Lines Order Steel Rails

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, Feb. 2.

Another week of oppressive quietness bordering on weakness in this market offers but little in the way of transactions from which hope of improvement may be gathered. With the exception of the placing of some rail tonnage by the Chicago & Northwestern railway and the Rock Island system, as the result of which an aggregate of 58,000 tons of Bessemer and open-hearth rails in the form of specifications and new contracts was placed, there was little interest displayed. The Colorado Fuel & Iron Co. is reported to have taken a contract for 5,000 tons of rails and inquiries covering 63,000 tons of standard sections are in the market. The placing of orders for structural steel was exceedingly limited. The disposition to withhold contracts is as much in evidence now as

at any time in the past 16 months. The fabricating shops and structural mills are fortunate in having received a fair volume of tonnage covering a wide range of small jobs, and it is upon this class of work that nearly all activity hinges. The movement of sheets and wire products improved somewhat during the latter half of January, and under the influence of beginning spring trade from the southwest, but shipments have been disturbed from Chicago territory by the establishing of exceedingly low rates by water from eastern seaboard points to the southwest. The letting of 9,000 tons of cast iron pipe is pending, otherwise the market is unusually quiet for municipal work. The market for old material is wellnigh stagnant, and such scrap as is moved must be turned over at a concession. Railroad lists are being absorbed with difficulty and the issuance of such lists more commonly results in the withdrawal of the greater portion, because satisfactory bids are lacking. Prices are generally lower and consumers are not at all eager to take on further supplies of scrap. The pig iron market during the last week was slightly improved, as compared with the week before, but the fact that the principal sales were made up of two transactions, involving a total of 3,000 tons, indicates the general quietness. There is evidence that some of the northern furnaces in particular are exceedingly anxious for tonnage, and prices are less firm in consequence. The month of January, however, shows an improvement in the latter half, as compared with the two weeks immediately following the holiday season.

Pig Iron.—Restlessness under the continued lack of buying grows more apparent from week to week. In volume, the transactions of the week under review were somewhat better than in the preceding week, but there is being engaged so much less than the capacity of the furnaces that some irregularities in price are again beginning to develop. Small lots of iron cannot be obtained at better than $17 local furnace, but desirable tonnages will undoubtedly bring out a better figure, which, in some cases, may be as low as $16.50. The southern interests continue to ask with apparent firmness $13 for No. 2 at Birmingham and seem to be supplied with more orders than the local stacks. Of the business placed last week, however, the larger part was taken by northern furnaces. Two sales of malleable Bessemer, in which about 3,000 tons were involved, constituted the only important transactions of the week. The price in both cases is understood to have been $17 at the furnace. The holding up of shipments by consumers, which at the beginning of the year, gave promise of becoming quite serious, has not increased further, and it is hoped, in view of the light buying, that iron previously purchased, will be taken promptly in the future. We quote for Chicago delivery as follows:

Lake Superior charcoal	$19.50
Northern Foundry No. 1	17.50 to 18.00
Northern Foundry No. 2	17.00 to 17.50
Northern Foundry No. 3	16.50 to 17.00
Southern foundry No. 1	17.60 to 18.10
Southern foundry No. 2	17.10 to 17.60
Southern foundry No. 3	16.60 to 17.10
Southern foundry No. 4	16.10 to 16.60
Southern No. 1 soft	17.60 to 18.10
Southern No. 2 soft	17.10 to 17.60
Southern gray forge	15.85 to 16.35
Southern mottled	15.60 to 16.10
Southern silveries, 4 per cent silicon	18.10 to 18.60
Southern silveries, 5 per cent silicon	18.60 to 19.10
Southern silveries, 6 per cent silicon	19.10 to 19.60
Jackson Co. silveries, 6 per cent.	19.90 to 20.40
Jackson Co. silveries, 8 per cent.	20.90 to 21.40
Jackson Co. silveries, 10 per cent	21.90 to 22.40
Malleable Bessemer	17.00 to 17.50
Standard Bessemer	17.90 to 18.40
Alabama basic	17.35 to 17.85

Billets.—Incompleted contracts for billets, upon which specifications are being made regularly, constitute practically all of the business that is being closed in semi-finished steel. A somewhat increased volume of manufacturing on the part of machine tool builders and a continuance of fair activity among agricultural implement makers afford some little support to a demand which otherwise would be almost entirely absent. Prices apparently are being well maintained for this particular material, and we quote 4 x 4-inch rolling billets $26.50, forging billets $23.50 base Chicago.

Merchant Steel.—The mill business on iron and steel bars during January was not altogether discouraging. The orders for steel bars taken by the leading interest during the month exceeded those of December by, approximately, 1,000 tons, and of the total tonnage booked, some 7,000 tons was made up of new business. The improved showing came largely in the latter part of the month, which adds a hopeful aspect to the outlook for February. Bar iron is in practically unchanged condition, and the mills are opening intermittently. Prices are not an important consideration, in view of the slight interest in tonnage, but it is understood that certain railroad inquiries, which have been in the market for some time, will eventually be placed at a concession from the present schedule obtained either in connection with prices or deliveries. We quote Chicago delivery as follows:

Bar iron, 1.50c to 1.53c; soft steel bars and bands, 1.58c, half extras; soft steel angles, less than 3 x 3, 1.68c; hoops, 1.98c base, full extras; planished or smooth-finished tire steel, 1.78c; iron finish, up to 1½ x ½-inch 1.73c base tire card; iron finish, 1½ x ½-inch and larger, 1.58c base steel card; channel for solid rubber tire, ¾ to 1 inch, 2.08c; and 1⅛-inch and larger, 1.98c; smooth-finished machinery steel, 1.83c; flat sleigh shoe, 1.63c; concave and convex sleigh shoe, 1.83c; cutter shoe, 2.95c; toe calk steel, 2.13c; railway spring, 1.93c base steel card; vehicle spring steel, 1.98c base vehicle card; crucible tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 56 per cent off the list for carload lots, and 52 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stacks, we quote as follows: Bar iron, 1.90c to 2c, full extras; soft steel bars, 1.80c per 100 pounds base, plus half extras; soft steel hoops, 2.30c full extras.

Plates.—The plate situation is one of the weakest departments of the market, as it has been for several months. Prices are being cut on every hand from $1 to $2 a ton, and this shading is no longer confined to the smaller sizes. Some preference is being shown for universal plates, which constitute the larger part of the tonnage being moved. We quote for Chicago delivery as follows:

Plates, ¼-inch and heavier, 6¼ to 100 inches wide, either universal or sheared, 1.78c Chicago. For extras see Pittsburg report. Shippers' prices for shipment from local stocks are as follows: Tank steel, ¼-inch and heavier, up to 72 inches wide, 2c to 2.10c; from 72 inches to 96 inches wide, 2.10c to 2.20c; 3/16-inch up to and including 60 inches wide, 2.10c to 2.15c; 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.10c to 2.15c. Flange and head quality, 25c extra.

Sheets.—At this season of the year, when normally Chicago territory is filling the demand for sheets from southwestern territory, the effect of the low rates established for water transportation from eastern seaboard points to the southwest is being felt in considerable degree. The price situation, which, up to very recently, has been fairly firm, seems to have been influenced by this, the weakness being augmented, no doubt, by the generally light tonnage, as has been

true throughout the past year. The call for light sheets, particularly galvanized and corrugated, is somewhat better than for heavier gages. We quote store prices:

No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; Nos. 18-20, 2.60c to 2.65c; Nos. 22-24, 2.65c to 2.70c; No. 26, 2.70c to 2.75c; No. 27, 2.75c to 2.80c; No. 28, 2.85c to 2.95c; No. 30, 3.25c; galvanized sheets, Nos. 10 to 16, 3.05c to 3.10c; Nos. 18 to 20, 3.15c 3.25c; Nos. 22 to 24, 3.30c to 3.35c; No. 26, 3.50c to 3.55c; No. 27, 3.70c to 3.75c; No. 28, 3.90c to 4c; No. 30, 4.40c to 4.50c.

Structural Steel.—The building projects, in which any desirable tonnage is under consideration, are moving very slowly, and contracts are being greatly delayed. The week brought out few transactions in structural steel of noteworthy size. The Kansas City Structural Steel Co. will fabricate 433 tons, of which 408 tons are specified Bethlehem shapes, for the Orear-Leslie building, Kansas City. It is expected that 682 tons for the Union Trust Co. building in San Francisco will be awarded to Milliken Bros., the low bidder, which concern also secured 164 tons placed by Geo. H. Fitch, of San Francisco. A Y. M. C. A. building in that city is under consideration, for which 665 tons will be required. It is reported that the Geo. A. Fuller Co., general contractor, has been awarded the contract for the Vendome hotel at Chicago. The contracts for steel for this building have not been placed. Both the bridge steel involved in the 8,000 tons inquiry from the Northern Pacific railway and the structural material for the warehouse of the Crane Co., at Chicago, are still hanging fire. Reports have been widely circulated through the press of extensive improvements to be made in the down town district of Chicago, but as yet nothing tangible has been developed from these. Preliminary drawings have been made covering a project to erect a 20-story hotel building, where the present Sherman house now stands. Structural mills and fabricators have a fair tonnage in their shops, but in the case of the latter, this tonnage is largely for small and scattered jobs. We quote:

Beams and channels, 3 to 15 inches, inclusive, 1.78c to 1.81c, delivered Chicago. For extras see Pittsburg report. Quotations from store are as follows for carload lots and over:

All angles, 3 inches and larger, including 6 inches, $1.95 per 100 pounds; angles over 6 inches, $2.05 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $1.95 per 100 pounds, base; channels, 3 inches and larger, $1.95 per 100 pounds base. Less than carload lots are $1 a ton higher than foregoing prices.

Rails and Track Supplies.—The rail situation has been somewhat improved by the releasing of specifications held over from last year. This has brought out 20,000 tons of Bessemer rails for the Chicago & Northwestern railway to be rolled at South Chicago, and 28,000 tons from the Rock Island system, also to be rolled by the Illinois Steel Co. In addition, the Chicago & Northwestern railroad placed an order for 10,000 tons of open-hearth rails, which will be rolled at the Gary plant and the Tooelee Valley Railroad Co. has ordered 5,000 tons from the Colorado Fuel & Iron Co. The tonnage immediately in prospect includes 18,000 tons for the Chicago, Rock Island & Pacific, 40,000 tons for the Chicago, Milwaukee & St. Paul, and 5,000 tons for the Great Western railway. The demand for light rails showed some improvement in the latter part of January, but prices are being shaded as much as $2 a ton from the regular quotations. The rail mills at South Chicago, Nos. 1 and 2, will be started up some time during the coming week, it is now expected. Specifications for spikes and bolts upon the contracts which were recently placed are being received in good volume. We quote for Chicago delivery as follows:

Standard Bessemer rails, $28; open-hearth, $30, f. o. b. mill in 500-ton lots and over; less than 500 tons, $2 extra, full freight to destination; light rails, 25-pound to 45-pound, $26; 20-pound $27; 16-pound, $28; 12-pound, $29. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; spikes, 1.80c to 1.90c; track bolts, with square nuts, 2.15c to 2.25c; with hexagon nuts, 2.30c to 2.40c. Small railroad and square boat spikes, 1.90c base, f. o. b. Chicago.

Merchant Pipe and Boiler Tubes.—While the tonnage has been too small to warrant indulgence in any very hopeful sentiments, it is somewhat encouraging to note that January, which is the dullest season of the year, did not fall behind the December tonnage. There is only a very limited demand for tubular goods from manufacturers, but it is expected that shipments to distant points, where ordering must anticipate the opening of the season by three or four weeks, will shortly bring an improvement in the tonnage situation. We quote mill discounts as follows:

	—Steel—	
	Black.	Galv.
¼ to 6 inches, inclusive.....	73.2	63.2
7 to 12 inches, inclusive.....	70.2	55.2

BOILER TUBES.

	Steel.	Iron.	Seamless.
2¼ to 5 inches, inclusive..	63.2	50.2	50.2

Cast Iron Pipe.—The only municipal letting of cast iron pipe scheduled for the current week is one for 1,000 tons at Minot, South Dakota. The awarding of the contract for the 8,000 tons at Kansas City, which has been pending for several weeks, is still being held in abeyance. A limited tonnage of small orders is being placed, but generally the market is unusually quiet. Prices remain firm, and we quote as follows: 4-inch water pipe, $28; 6 to 14-inch, $27; larger sizes, $26; gas pipe, $1 a ton higher.

Wire Products.—The disturbance of freights from the east by water to the southwest has been felt also in connection with the movement of wire products from Chicago to southwestern territory, where the spring trade is now opening. The latter part of January witnessed a marked improvement, as compared with the apathy following the holiday season, and, while new contracts totalled somewhat under the December figures, the specifications received in January exceeded those of the preceding month. We quote for Chicago delivery as follows:

Wire nails, jobbers' carload lots, $2.13; retailers' carload lots, $2.18; painted barb wire, jobbers' carload lots, $2.28; retailers' carload lots, $2.33, with 30c for galvanizing; plain wire to jobbers in carloads, 1.98c, and to retailers in carloads, $2.03. Wire rods, Bessemer, $33; open-hearth, $34; chain rods, $33, f. o. b. Pittsburg.

Old Material.—The capacity for consuming scrap in this market apparently grows more restricted and concessions of from 25 to 50 cents below the prices quoted a week ago have been necessary to move even the small quantities for which buyers have been found. The list of 6,500 tons sent into the market by the Chicago, Burlington & Quincy road last week was largely withdrawn as the result of failure to dispose of the leading items, re-rolling rails and wrought scrap, except at marked concessions. The current buying by the mills is entirely from hand to mouth, and, while some of the mills have accumulated fair tonnages of certain goods, there seems to be no present incentive for adding to what they now have in hand. The market

offers no indications of immediate firmness. The Chicago & Northwestern railroad has a list out comprising 1,800 tons, of which 400 tons are re-rolling rails. We have revised our prices, and quote as follows:

Old car wheels	$15.25 to 15.75
Old iron rails	18.25 to 18.75
Re-rolling rails (4 ft. and over)	15.25 to 15.75
Old steel rails (4 ft. and under)	14.50 to 15.00
Light section relayers, 45 lbs. and under, subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	19.00 to 19.50
Frogs, switches and guards	13.75 to 14.25
Heavy melting steel	12.50 to 13.00

We quote, net tons, as follows:

No. 1 R. R. wrought	$13.00 to 13.50
No. 2 R. R. wrought	12.00 to 12.50
Knuckles, couplers and springs	13.00 to 13.50
Shafting	16.00 to 16.50
Iron car axles	19.00 to 19.50
Steel car axles	17.75 to 18.25
Dealers' forge No. 1	10.25 to 10.75
Pipes and flues	9.75 to 10.25
No. 1 cast, 150 lbs. and less	12.75 to 13.25
No. 1 mill	7.75 to 8.25
Mixed busheling (Nos. 1 and 2)	7.75 to 8.25
Country sheet	5.50 to 6.00
No. 1 boiler cut	9.75 to 10.25
Boiler punchings	12.00 to 12.50
Cast borings	6.50 to 7.00
Mixed borings, etc	7.00 to 7.50
Machine shop turnings	8.25 to 8.75
Railroad malleable	12.50 to 13.00
Agricultural malleable	11.00 to 11.50
Stove plate and light cast scrap	11.75 to 12.25
Old iron splice bars	15.75 to 16.25

METAL MARKET

ST. LOUIS.

Feb. 1.

Lead and Zinc.—The base price for zinc ore in the Joplin district last week was $38 to $40 a ton; the highest price reported being $43 for 60 per cent ore. Quite a number of the larger mines have closed temporarily as a result of the decline. The weak market has caused a number of large bins of surplus ore to be held for months, operators manifesting a determination not to sell until the prices advance.

The lead market remained practically the same, with 80 per cent ore selling from $51 to $54 a ton. A price of $19 a ton was obtained for silicate of zinc, 40 per cent ore.

CHICAGO.

Feb. 2.

Copper metal shows signs of some weakness in the absence of consistent buying. Small orders are fairly numerous, but buying is greatly restricted. Tin is weak and lower and the lead market is dull. Spelter is unchanged. We quote as follows:

Lake copper, carload lots, 14¼c; castings, carload lots, 13¾c; pig tin, 30c; spelter, 5.25c to 5.50c; pig lead, desilverized, 4.30c to 4.35c in 50-ton lots; corroding, 4.75c to 4.80c in 50-ton lots; car lots, 2½c per 100 pounds higher; sheet zinc, 7c list, f. o. b. LaSalle in car lots of 600-pound flasks; Cookson's antimony, 10½ to 11c; other grades, 10c.

Old metals have moved slowly and prices are unchanged. We quote to dealers as follows:

Copper wire, 12½c; heavy copper, 12½c; light copper, 11¼c; heavy red brass, 11½c; heavy yellow brass, 8½c; light brass, 6½c; No. 1 red brass borings, 9c; No. 1 yellow brass borings, 9c; brass clippings, 8½c; tea lead, 3¼c; lead scrap, 3¾c; zinc, 3.25c; tin plate, 24c; tin foil, 23c; pewter, 16c; electrotype plates, free from wood, 4c; electrotype dross, 2¾c; stereotype plates, 4¼c; stereotype dross, 3c; prime slab zinc dross, $55 per ton.

NEW YORK.

Feb. 2.

Copper.—The continuance of the decline on the London market has served to carry down domestic prices to a lower level, but current business is unimportant, even at the reduction. We quote as follows: Lake, 13¾c to 14c, electrolytic, 13¼c to 13½c; casting, 13⅛c to 13⅜c.

Pig Tin.—The market has been in a state of inactivity during the week, owing to the unwillingness of consumers to purchase until they are certain that another decline is not in prospect. The metal can be had at 27¼c to 27¾c.

Pig Lead.—On extremely small business the local market has suffered a slight decline and what selling is now being done is on the basis of 4.12½c to 4.17½c, New York.

Spelter.—The foreign market is extremely dull and domestic sales are only possible at lower figures. We quote, 5.02½c to 5.07½c, New York.

Antimony.—We quote: Cookson's, 8¼c to 8⅜c; Hallett's, 8c to 8⅛c; ordinary brands, 7½c to 7⅝c.

LOW PRICE FOR BESSEMER.

(Special Telegram).

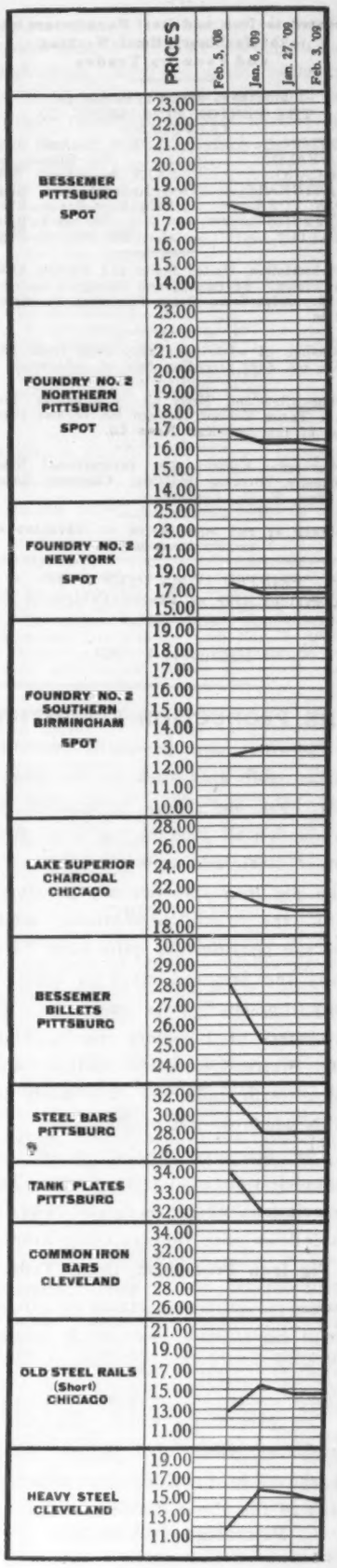
Pittsburg, Feb. 3—Another sale of 100 tons of spot Bessemer was made Tuesday at $16 valley, or $16.90 delivered. The market for small lots appears around this price.

The Pennsylvania railroad is inquiring for 2,500 tons of structural material for this year's track elevation work in Chicago.

Line pipe inquiries aggregate 140 miles.

The rolling mill of the Sheffield Rolling Mill Co., Sheffield, Ala., will be offered for sale Feb. 24, under the direction of H. W. Worthington, trustee.

PRICE CHART.



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February 4, 1909.

THE PRODUCTION STATISTICS.

Elsewhere are presented statistics made public this week by the American Iron and Steel Association of production in 1908 of pig iron, Bessemer steel, and rails of all classes. The pig iron statistics are presented with the usual promptness, while the rail statistics are quite early. Usually the first rail statistics embrace only Bessemer rails made by the producers of Bessemer ingots, while the present statistics include also open-hearth rails and rails made by mills which do not produce steel.

The pig iron production is not completely detailed as to grades. The descriptions as far as given compare as follows with the preceding year:

Pig Iron Production, Gross Tons.

	1907.	1908.
Bessemer	13,231,620	7,216,976
Basic	5,375,219	4,010,144
Spiegel and ferro	339,348	152,018
Charcoal	437,397	249,146
Balance	6,397,777	4,307,734
Totals	25,781,361	15,936.018

The percentage which this year's production constituted of last year's is shown in the following table for each of the above items:

Percentage, 1908 to 1907.

Total	61.81
Bessemer	54.54
Basic	74.60
Spiegel and ferro	44.80
Charcoal	56.96
Balance	67.33
Steel making	60.06

The figures used for "steel making iron" comprise the totals of Bessemer, basic, spiegeleisen and ferro-manganese and therefore are not strictly exact, but the difference is slight, and it may be taken that steel making iron production was 60 per cent as large in 1908 as in 1907. Thus the production of steel making pig iron decreased more than did the production of the total of other grades, including foundry, malleable, ferro-silicon, white iron, etc.

That is the same trend which was observed in the 1907 statistics compared with the preceding year. While the total production of pig iron increased from 1906 to 1907 by some 475,000 tons, the production of Bessemer and low phosphorus iron decreased some 600,000 tons, leaving, with an increase of 350,000 tons in basic, a net decline in steel making pig.

Comparing 1908 with 1906, a more striking divergence is therefore observed. Bessemer is only 52.14 per cent, basic is 79.90 per cent, the total of Bessemer, basic and manganese metals is 59.39 per cent, and the total of all other, chiefly foundry iron, is 75.38 per cent.

This showing is quite noteworthy, that from 1905 to 1908 the production of steel making iron decreased by more than 40 per cent, while the production of foundry iron and cognate grades decreased by less than 25 per cent. It would be idle to attempt to deny that a part at least of this divergence has been due to the divergence in prices between finished rolled steel on the one hand and iron castings on the other hand.

The production of Bessemer steel in 1908 shows a large drop, continuing the decline which started in 1907. The record year was 1906, with 12,275,830 tons, followed by 1907, with 11,667,549 tons, the next highest year, while 1908, with 6,116,755 tons, is the smallest year since 1897, when the output was 5,475,315 tons. That year was the record in its time, exceeding any previous year by more than 11 per cent.

The great decline in Bessemer steel production is significant of the change in progress. Whether the record output of 1906 will ever be passed depends upon the course of demand in the next few years. If demand for iron and steel in general soon passes that of 1906 and the first ten months of 1907, then a new record in Bessemer steel production will be made, for the capacity is in existence. If such heavy demand should not occur until a considerably later year, then it is improbable that the 1906 output will ever again be touched, for open-hearth steel will have had opportunity to make further gains in prestige and capacity meanwhile.

It may be said on first glance that the particularly striking decline in Bessemer steel output is due to the great shrinkage in rail demand, since total production of rails in 1906 was 3,977,887 tons, decreasing slightly to 3,633,654 tons in 1907, and scoring the great drop to 1,921,611 tons in 1908. That would be a short sighted view, however, since open-hearth rail production increased from 186,413 tons in 1906 to 252,704 tons in 1907, and to 567,304 tons in 1908. The 1909 production will unquestionably be much larger, as Youngstown and Gary are now in position to make open-hearth rails, adding two open-hearth rail plants this year to the total capacity, one of them the largest rail plant in the world.

In 1906 open-hearth rails comprised less than 5 per cent of the total production, but it is far from improbable that in the current year the production of open-hearth rails will exceed the production of Bessemer rails.

In 1906 and 1907, on an average, the production of basic pig iron was 52 per cent of the production of basic steel ingots and castings. Should the same percentage hold good for 1908, the production of basic steel would be 7,700,000 tons, and that, with acid open-hearth steel, Bessemer steel and miscellaneous steel, would make a total steel output for the year of between 14,500,000 and 15,000,000 tons, against 23,362,584 tons in 1907 and 23,398,136 tons in 1906.

ANNUAL REPORT OF THE WARWICK IRON & STEEL CO.

The annual report of the Warwick Iron & Steel Co. for the year ending Dec. 31, 1908, has been submitted by the board of directors through President Edgar S. Cook. The balance sheet shows earnings for the year $174,245.74, less $26,613.21 interest on bonds; leaving net earnings for the year $147,632.53.

After calling attention to the improvements which have been installed at the blast furnace plant, President Cook says:

The production of pig iron for 1908 was influenced unfavorably by the partial industrial paralysis following upon the financial conditions of the last quarter of 1907. The consumption of merchant pig iron fell off probably 75 per cent from the maximum. Commencing with June, it gradually increased, so that by November the consumption had reached about 50 per cent of the normal. The eastern market was invaded by southern, western and northern furnace products. Notwithstanding the rapid blowing out of many furnaces, market prices gradually yielded, and finally became demoralized, falling below the cost of production. From January to September, the problem was to find a market for our full production. Reference was made in the report for 1907, as to the valuable assets in the shape of unfilled contracts. There has been no disappointment, as a large percentage of the earnings for 1908 is due to the shipment of iron sold during the late spring and summer months of 1907. Our customers acted honorably, and carried out their contracts for iron, thus enabling us to fulfill all contracts for raw materials—ore, coke, etc. The decision to install the Gayley dry air plant was based upon a saving of 50 cents per ton of iron in the cost of converting ore into pig iron. The operation of No. 1 furnace for 9½ months, and of No. 2 furnace for the last three months of 1908, indicate that the saving actually realized has exceeded the estimate, as compared with previous records.

MEETING OF THE AMERICAN ANTI-ACCIDENT ASSOCIATION.

Meetings of the American Anti-Accident Association, with headquarters at Sharpsville, Pa., will be held Feb. 11, both afternoon and evening, at the Y. M. C. A. hall, 215 West Twenty-third street, New York city, for the purpose of further considering ways and means of preventing accidents. A hearty invitation is extended by the society to government and municipal officials, manufacturers, managers, superintendents, merchants, labor leaders, factory inspectors, fire and life insurance officials, foundrymen and all others who are interested in this work.

An interesting program is being prepared and some of the addresses that will be delivered follow: "The Application of Safety Devices," illustrated by lantern slides, Dr. Wm. H. Tolman, director of the New York Museum of Safety and Industrial Hygiene; "Industrial Accidents and the Inventors," Joseph J. O'Brien, Washington, D. C.; "Safety Devices in Machine Shops and Manufacturing Establishments," Prof. John E. Sweet, Syracuse, N. Y.; "Our Shameful Lead in Railway Accidents and One Sure Method of Checking It," Edward Bunnell Phelps, editor of the *American Underwriter*, New York city; "Hoodlumism in Holiday Observance," Mrs. Isaac Q. Rice, New York city, and "Wage Workers' Accident Insurance and Compensation Fraternity," Thomas D. West, Sharpsville, Pa.; "An analysis of 5,500 Machine Shop Accidents," L. P. Alford of editorial staff of *American Machinist*.

JANUARY PIG IRON PRODUCTION ABOUT EQUAL TO DECEMBER.

Our official blast furnace returns for January, incomplete at date of publication, indicate strongly that the production of pig iron in January will equal within a few thousand tons the production in December, which was 1,723,664 tons. The production of the merchant furnaces for January appears to have fallen off about 34,000 tons from the December production, which was 614,250 tons. On the other hand, the non-merchant or steel making furnaces have increased their production something like 40,000 tons. At the same time there has been a slight increase in the production of spiegel and ferro throughout the country. The returns, while incomplete, also show that two additional non-merchant stacks blew in in January, and six merchant stacks; one merchant stack blew out Feb. 1, and announcement is made that two merchant stacks and one steel stack will blow in the first week in February.

NATIONAL METAL TRADES ASSOCIATION.

President Copeland, of the National Metal Trades Association, announces that the new constitution and bylaws have been adopted by a very handsome majority of the members, the vote being 595 to 23. The next annual convention of the association will be held at the Hotel Astor, New York City, on April 14-15. Among the subjects to be discussed will be the following: The Premium System of Paying for Labor; Piece Work Systems; Profit Sharing Systems; Employers' Liability Insurance; Provision for Employes Grown Old in Service. Special effort will be made to have papers of real worth presented. Commissioner Wuest is endeavoring to obtain a large amount of information in regard to conditions among workmen and on the subject of industrial education.

FINANCIAL STATEMENT FOR REPUBLIC IRON & STEEL CO.

The executive committee of the Republic Iron & Steel Co. through Chairman John A. Topping has submitted its semi-annual financial statement and income report for the six months ending Dec. 31, 1908, in which the following figures are shown:

Net earnings after deducting charges for maintenance and repairs, amounting to $401,856.91		$1,231,647.54
Interest and dividends on investments, less interest paid		27,307.42
Total profit for the six months		$1,258,954.96
Less—		
Appropriations for reconstruction, etc.	$193,382.93	
Extinguishment fund.	74,604.22	267,987.15
Net profits for the six months.		$ 990,967.81
Interest on first mortgage 5 per cent bonds		208,637.50
Surplus for the six months.		$ 782,330.31
Surplus at July 1, 1908		4,699,526.96
Net surplus		$5,481,857.27

In his report Chairman Topping says:

While the net profits shown are for a period of six months, your actual operations cover five months only, as manufacturing was suspended during July, 1908, on account of labor adjustments at your northern plants, and due to the miners' strike south. Full operations there were not resumed until Nov. 8, 1908.

Operations for the past six months, as compared with normal periods of activity, have averaged approximately as follows:

	Per cent.
Finishing mills and factories	55
Steel works	70
Blast furnaces	66⅔

Your business booked promises some improvement to operations, but your executive committee were of the opinion that under present unsettled business conditions, it was wise to defer action on resumption of dividends, even though your earnings and net assets suggest the propriety of dividend payments at this time.

OBITUARIES.

Samuel Ligget, for a number of years at the head of the Philadelphia pig iron firm of Robert Ligget & Co., died Jan. 22 at his home in that city at the age of 72.

Levi Chapman Lathrop, a well known banker of New York City, and charter member of the Cotton Exchange, died Feb. 2 at his home, aged 65. He was president of the Bessie Ferro Silicon Co. and vice president of the Columbus & Hocking Coal & Iron Co.

Herbert J. Burrough, aged 46 years, assistant treasurer and general manager of the Builders' Iron Foundry, Providence, R. I., was found dead in his room in the Fort Pitt Hotel, Pittsburg, Jan. 30. His death was due to rheumatism of the heart with which he had suffered for ten years. Mr. Burrough was treasurer of the Rhode Island branch of the National Metal Trades Association in 1908.

The stack of the Globe Iron Co., Jackson, O., was lighted Jan. 12.

PREPARATIONS FOR FOUNDRYMEN'S CONVENTION.

On Jan. 27, a meeting was called at the Sinton hotel in Cincinnati of the local general committee for the purpose of organization to prepare for the reception and entertainment of the American Foundrymen's Association convention, which will be held in Cincinnati during the week of May 17. About 3,000 delegates are expected to attend.

James Albert Green, of Matthew Addy & Co., was elected permanent chairman; William Gilbert, of the Buckeye Foundry Co., treasurer, and Will L. Finch, of the Convention League, secretary. There were present at the meeting, F. M. Perkins, of Freeport, Ill., president of the Foundry and Manufacturers' Supply Association, one of the three organizations which will assemble at the convention. There will be a joint meeting at the Sinton on Friday, Feb. 5, of the executive committee of Mr. Perkins' organization, with that of the American Foundrymen's Association, and other organizations which are to convene, and the local committee will participate in the meeting which will be for the purpose of arranging for the convention.

The local committee named three subcommittee chairmen as follows, each chairman to name four colleagues:

Finance, George Morris, of the John B. Morris Foundry Co., who selected as members of his committee the following Theodore Bollman, of the Bollman-Wilson Foundry Co.; Lewis Walter, of Walter-Wallingford & Co.; Walter Geier, of the Modern Foundry Co.; F. S. Brunner, of the S. Obermeyer Co.

Entertainment—J. K. Pollock, of Rogers, Brown & Co., who selected as members of his committee, J. A. Green, of Matthew Addy & Co.; Harry Frohman, of the S. Obermeyer Co.; F. M. Eaton, of Hickman, Williams & Co., and John Sargent, of the Domhoff & Joyce Co.

Hall—John Hill, of Hill & Griffith, who selected as members of his committee, John J. Bruce, of the John J. Bruce Foundry; Justis Thorner, of the S. Obermeyer Co.; F. W. Weissman, secretary of the Foundry Foremen's Association, and Herbert Black, of Hickman, Williams & Co.

The Washington Steel & Bolt Co., Edmonds, Wash., announces that it has about completed a 40 by 60 foot addition to its plant and that a new automatic bolt trimmer, a finning machine and a thread roller have been added to the equipment. The company also expects to discard its old steam plant and use individual motor drive throughout its entire plant.

SHARP DECLINE

In Production of Pig Iron, Bessemer Steel and Rails Last Year.

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1908.

Total Production.—The total production of all kinds of pig iron in 1908 was 15,936,018 gross tons, against 25,781,361 tons in 1907, a decrease of 9,845,343 tons, or over 38.1 per cent. The following table gives the half-yearly production in the last four years in gross tons:

Periods.	1905.	1906.	1907.	1908.
First half	11,163,175	12,582,250	13,478,044	6,918,004
Second half	11,829,205	12,724,941	12,303,317	9,018,014
Total	22,992,380	25,307,191	25,781,361	15,936,018

Classified Production.—The production of Bessemer and low phosphorus pig iron in 1908 was 7,216,976 tons, against 13,231,620 tons in 1907, a decrease of 6,014,644 tons, or over 45.4 per cent. In the second half of 1908 the production was 3,828,485 tons, as compared with 3,388,491 tons in the first half, an increase of 439,994 tons. The production of low phosphorus pig iron alone in 1908 amounted to 130,616 tons, against 204,537 tons in 1907. The production of Bessemer and low phosphorus pig iron in 1908 was the smallest since 1897, when 5,795,584 tons were made.

The production of basic pig iron in 1908, not including charcoal of basic quality, was 4,010,144 tons, against 5,375,219 tons in 1907, a decrease of 1,365,075 tons, or nearly 25.4 per cent. In the second half of 1908 the production amounted to 2,528,532 tons, against 1,481,612 tons in the first half, an increase of 1,046,920 tons. The total production in 1908 was slightly less than that of 1905, when 4,105,179 tons were made.

The production of spiegeleisen and ferro-manganese in 1908 was 152,018 tons, against 339,348 tons in 1907, a decrease of 187,330 tons. The production of ferro-manganese alone in 1908 was 40,642 tons, against 55,918 tons in 1907. Of spiegeleisen alone it was 111,376 tons, against 283,430 tons in 1907. In addition to the above several hundred tons of ferro-phosphorus were produced in the second half of 1908.

Production by Fuels.—The production of bituminous coal and coke pig iron in 1908 amounted to 15,331,863 tons, as compared with 23,972,410 tons in 1907, a decrease of 8,640,547 tons. In the first half of 1908 the production was 6,578,370 tons and in the second half it was 8,753,493 tons. A small quantity of iron made experimentally in Michigan with manufactured gas is included in the figures for the second half of 1908.

The production of anthracite and coke mixed pig iron in 1908 amounted to 353,315 tons, as compared with 1,335,286 tons in 1907, a decrease of 981,971 tons. In the first half of 1908 the production amounted to 208,720 tons, against 144,595 tons in the second half.

The production of pig iron with anthracite coal alone in 1908 amounted to 1,694 tons, as compared with 36,268 tons in 1907.

The production of charcoal pig iron in 1908 was 249,146 tons, against 437,397 tons in 1907, 433,007 tons in 1906, 352,928 tons in 1905, and 337,529 tons in 1904. The decrease in 1908 as compared with 1907 was 188,251 tons. A small quantity of pig iron made with charcoal and electricity is included in the figures for 1908. In the first half of 1908 the production amounted to 129,220 tons, and in the second half to 119,926 tons. No pig iron was made in 1907 or 1908 with charcoal and coke mixed.

Active Furnaces.—The whole number of furnaces in blast on Dec. 31, 1908, was 236, against 168 on June 30, 1908, and 167 on Dec. 31, 1907. The number of furnaces in blast at the end of 1907 was smaller than at the close of any year since 1896, when but 159 furnaces were active. At the close of 1908 there were 223 idle furnaces, as compared with 276 idle furnaces at the close of 1907.

Bessemer Steel.

The association gives complete statistics of the production of Bessemer steel ingots and castings in the United States in 1908.

Ingots and Castings.—The total production of Bessemer steel ingots and castings in 1908 was 6,116,755 gross tons, against 11,667,549 tons in 1907, a decrease of 5,550,794 tons, or over 47.5 per cent. The production in 1908 was the smallest since 1897, when 5,475,315 tons were made. The year of largest production was 1906, when 12,275,830 tons, or over double the production of 1908, were made. The following table gives the production of Bessemer steel

ingots and castings in the last six years. Of the total in 1908 about 20,559 tons were steel castings, as compared with 33,273 tons in 1907.

Years. Gross tons.	Ingots and castings.	Years. Gross tons.	Ingots and castings.
1903.....	8,592,829	1906.....	12,275,830
1904.....	7,859,140	1907.....	11,667,549
1905.....	10,941,375	1908.....	6,116,755

Below we give by states the production of Bessemer steel ingots and castings since 1905:

States—Ingots and castings.	1905. Gross tons.	1906. Gross tons.	1907. Gross tons.	1908. Gross tons.
Pennsylvania	4,491,445	4,827,725	4,351,841	2,106,382
Ohio	3,131,149	3,769,913	3,636,679	1,955,446
Illinois	1,651,250	1,684,772	1,723,073	1,237,747
Other states	1,667,531	1,993,420	1,955,956	817,180
Total	10,941,375	12,275,830	11,667,549	6,116,755

As shown by the table, the decrease in production in Pennsylvania in 1908 as compared with 1907 amounted to 2,245,459 tons, or over 51.5 per cent; in Ohio to 1,681,233 tons, or over 46.2 per cent; in Illinois to 485,326 tons, or over 28.1 per cent; and in other states to 1,138,776 tons, or over 58.2 per cent.

Steel Rails.

The production of all kinds of rails in the United States in 1908 amounted to 1,921,611 tons, against 3,633,654 tons in 1907, a decrease of 1,712,043 tons, or over 47.1 per cent. The falling off in Pennsylvania amounted to 637,745 tons and in the remainder of the country to 1,074,298 tons. The total production was the smallest since 1897. The maximum production was reached in 1906. The year of next largest production was 1907. Rails rolled from purchased blooms, crop ends, scrap, and "seconds," and re-rolled and renewed rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. In the following table the production of all kinds of rails in 1908 is given by states, followed by the production in 1907:

States—Gross tons.	Bessemer.	Open-hearth.	Iron.	Total.
Pennsylvania	315,563	177,461	...	493,024
Other states	1,038,673	389,843	71	1,428,587
Total for 1908	1,354,236	567,304	71	1,921,611
Total for 1907	3,380,025	252,704	925	3,633,654

Bessemer Steel Rails.—The production of Bessemer steel rails in 1908 amounted to 1,354,236 tons, against 3,380,025 tons in 1907, a decrease of 2,025,789 tons, or over 59.9 per cent. The 1908 production was the smallest since 1896, when 1,116,958 tons were rolled. Of the total in 1908, 1,272,686 tons were rolled by makers of domestic ingots and 81,550 tons by companies which did not operate Bessemer converters, the latter including a small tonnage of manganese rails rolled from purchased Tropenas ingots. Included in the total by makers of domestic ingots are about 71,900 tons of re-rolled rails, including a few thousand tons rolled from steel scrap. The accompanying table gives the production by states from 1905 to 1908 in gross tons.

Gross tons, Bessemer rails.	1905.	1906.	1907.	1908.
Pennsylvania	1,097,154	1,298,409	1,093,932	315,563
Other states	2,095,193	2,493,050	2,286,093	1,038,673
Total	3,192,347	3,791,459	3,380,025	1,354,236

Open-Hearth Steel Rails.—The production of open-hearth steel rails in 1908 was 567,304 tons, against 252,704 tons in 1907. The increase in 1908 over 1907 was 314,600 tons, or more than 124 per cent. Almost all the open-hearth rails in 1908 were rolled from basic steel, and virtually all were rolled by producers of open-hearth ingots. A few thousand tons of basic nickel steel rails are included in the total for 1908. The maximum production was reached in 1908. Alabama made over 44 per cent of the open-hearth rails that were rolled in 1908, Pennsylvania, Colorado, and New York rolling the remainder in the order named. In 1907 Alabama rolled over 59 per cent of the total.

Iron Rails.—The production of iron rails in 1908 was 71 tons, all rolled in Illinois, and all weighing less than 45 pounds to the yard. In 1907 the production of iron rails was 925 tons.

Weight of All Kinds of Rails.—The following table gives the production of all kinds of rails in 1908 according to the weight of the rails per yard. Street and trolley rails are included:

Kinds of rails, gross tons.	Under 45 pounds.	45 pounds and less than 85.	85 pounds and over.	Total Gross tons.
Bessemer rails	169,384	456,144	728,708	1,354,236
Open-hearth rails	14,414	232,054	320,836	567,304
Iron rails	71	.....	.....	71
Total	183,869	688,198	1,049,544	1,921,611

The production of rails weighing under 45 pounds to the yard shows a decrease of 111,969 tons in 1908 as compared with 1907, rails weighing 45 pounds and less than 85 pounds a decrease of 881,787 tons, and rails weighing 85 pounds and over a decrease of 718,287 tons.

Pig Iron Production in Canada.

The association has received direct from the manufacturers the statistics of the production of all kinds of pig iron in Canada in the calendar year 1908.

Total Production.—The total production of all kinds of pig iron in Canada in 1908 amounted to 563,672 tons, against 581,146 tons in 1907, a decrease of 17,474 tons, or about 3 per cent.

In the first half of 1908 the pig iron production of Canada amounted to 307,074 tons and in the second half to 256,598 tons, a decrease of 50,476 tons.

Large Office Building.—C. L. Gray, president of the C. L. Gray Construction Co., on his return to St. Louis from New York, several days ago, confirmed the report that a St. Louis syndicate would erect a 30-story office building at Liberty and Nassau streets, New York City. The building will be designed by Henry Ives Cobb. St. Louis, St. Joseph and Kansas City capitalists are interested in the enterprise. A corporation will be formed under the laws of New York to hold the title to the real estate and the improvements. The lot upon which the building is to be erected is 57 x 82 feet, and cost $1,200,000. An option on the property has been held by a St. Louis man for more than a year. The building will cost approximately $1,200,000. Arrangements have been made for a loan of $1,700,000 in New York. The names of the men composing the syndicate have not been divulged.

The Northwest Bridge Works, fabricator, with its main office at Portland, Ore., will shortly open branch offices in Seattle and Spokane, Wash., in order to take care of the business in steel and reinforced concrete construction.

OUR FOREIGN COMMERCE.

(Continued from first page.)

to be through with such operations. The formation of the United States Steel Corporation and the development of a definite policy has had much to do with the abandonment of the old-fashioned dumping. There would be danger of precipitating an international trade war, while the principle of taking export business in order to run a plant at full capacity applies with but limited force with the Steel Corporation, for the reason that, owning a number of plants in each line, it can close one or more plants entirely, and by bunching domestic orders, obtain full rolling schedules.

Detailed evidence that there has been little, if any, dumping is to be found in the statistics themselves. Years ago pig iron was dumped to the extent of a quarter million tons a year, but in 1908 the exports were only 46,696 tons, the smallest pig iron exports since 1903. Exports of crude steel were 112,117 tons, showing a slight increase over 1907, but a heavy decrease from 1904, 1905, and 1906. The decrease in exports has been more or less uniform throughout the list, down through the finely finished products, indicating that the export trade has been pursued in a regular and orderly manner.

Prior to the middle of 1897, tonnage statistics of iron and steel exports were quite incomplete, no tonnage returns being obtained of such commodities as wire rods, billets, ingots and blooms, structural iron and steel, etc. Such exports had probably been relatively light. The total exports, as reported, are given in the table below. In 1898 pig iron exports were 249,357 tons and rail exports 291,038 tons, exports of other lines being relatively light.

Iron and Steel Exports, Gross Tons.

1898	901,427
1899	942,689
1900	1,154,284
1901	700,852
1902	372,398
1903	326,590
1904	1,167,710
1905	1,010,255
1906	1,325,740
1907	1,301,979
1908	964,266

Thus in point of weight the iron and steel tonnage exports in 1908 have been exceeded only in five years. Reduced to value, in terms of finish, and disregarding fluctuations in value on account of market conditions, it is probable that the 1908 exports would make a still more favorable comparison. Pipes and fittings, for instance, which are relatively highly finished, were not separately stated prior to July 1, 1905, but in 1908 they comprised nearly 12 per cent the total weight of exports as reported.

Value of All Exports.

In the following table is given the value of all iron and steel exports in the past six years. These values include the value of the tonnage lines already referred to, and also the value of hardware, machinery, etc., but not the value of agricultural machinery, which is separately returned.

1903	$ 99,035,865
1904	128,455,613
1905	142,928,513
1906	172,555,588
1907	197,066,781
1908	151,113,114

The machinery and other non-tonnage lines have made an excellent showing in recent years. The growth of such exports has been more striking than that of the regular tonnage lines. Some manufacturers suffered a decrease in their foreign trade in 1908, largely, it is said, through foreign manufacturers being able to obtain their raw materials more cheaply on account of the depressed condition of the foreign iron and steel producing industries.

The Monthly Movement.

The following table shows the import and export movement in 1908 by months:

	Imports.	Exports.
January	28,008	74,352
February	19,054	81,755
March	15,885	96,437
April	12,343	93,522
May	13,584	64,020
June	21,106	69,779
July	18,320	86,806
August	13,186	87,244
September	13,122	76,727
October	13,214	85,668
November	19,960	71,028
December	19,139	77,656
Totals	206,955	964,266

The monthly movement has not been significant of any general change in the industry. June showed next to the heaviest imports of the year, although a very dull month in the domestic trade. January showed the largest imports, involving probably belated deliveries of material not badly needed. In exports March was the heaviest month, but two months later, in May, the lightest exports of the year were shown. On the whole, second half exports were lighter than first half, while domestic business moved in the opposite direction.

The Iron Ore Movement.

The iron ore movement in tons is shown in the table below. Iron ore is not included in the regular tonnage figures of imports and exports, nor is the value included in the total values already reported.

	Imports.	Exports.
1903	980,440	80,611
1904	487,613	213,865
1905	845,651	208,058
1906	1,060,390	265,240
1907	1,229,168	278,608
1908	776,898	309,099

Iron and Steel Exports, Gross Tons.

	December		Twelve months ending December,	
	1907.	1908.	1907.	1908.
Scrap	702	843	25,689	21,834
Pig iron	3,104	4,732	73,703	46,696
Billets, sheet bars, etc.	5,160	7,893	79,991	112,177
Wire rods	173	912	10,697	7,412
Rails	20,763	10,243	338,906	196,510
Structural iron and steel	9,401	9,935	138,442	116,878
Bar iron	954	548	23,743	8,224
Steel bars	4,616	4,592	74,464	43,881
Sheets and plates	9,152	11,428	122,696	104,993
Tin plates	304	285	10,203	11,878
Hoop, band and scroll	1,357	455	8,601	4,339
Wire	13,570	11,953	161,223	136,167
Wire nails and spikes	2,504	3,331	42,189	26,510
Cut nails and spikes	407	735	6,929	7,019
All other, including tacks	386	706	7,672	5,377
Pipes and fittings	13,466	9,065	176,831	114,371
Totals	86,019	77,656	1,301,979	964,266

Iron and Steel Imports, Gross Tons.

	December		Twelve months ending December,	
	1907.	1908.	1907.	1908.
Scrap	1,136	1,061	27,652	5,090
Pig iron	11,027	10,330	489,475	92,202
Billets, bars and steel, n. e. s.	892	2,204	19,334	11,212
Wire rods	1,270	652	17,076	11,208
Rails	201	48	3,752	1,719
Structural	23	670	2,294	3,623
Bar iron	3,892	1,106	39,746	19,672
Sheets and plates	231	393	3,748	2,629
Tin plates	1,542	2,475	57,773	58,490
Hoop, band and scroll	41	200	1,499	1,110
Totals	20,255	19,139	662,349	206,955

RECEPTION TO FOUNDER OF NATIONAL TUBE CO.

John H. Flagler, of New York City, founder of the National Tube Co., was the guest of a celebration Jan. 27 which was prepared in his honor by the city of McKeesport, Pa., to mark his return to the scene of his former activities after an absence of 20 years. Mr. Flagler was the central figure at a banquet tendered by the chamber of commerce of the city. His address was a plea for non-partisan consideration of the tariff problem and embodied a strong endorsement of the protective principle. The beginning of the extensive operations of the National Tube Co. was laid by Mr. Flagler in East Boston 40 years ago, when he founded the National Tube Works in an unpretentious plant 80 x 100 feet. Two years later in 1870 he removed to McKeesport, Pa., setting up his plant with a force of 125 men. When he left New York in 1888 the industry had become the National Tube Co. and had 3,000 men upon its payrolls.

AMONG MACHINERY MAKERS.

NEW YORK.

D., L. & W. R. R. Inquiry for Machine Tools—Other Railway Business.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Feb. 2.

The closing days of January were featured by the circulation of a list covering the entire machine tool requirements of the Delaware, Lackawanna & Western for the equipping of its new shops at Scranton, Pa. This list calls for in the neighborhood of 90 tools, and prices are asked on both motor and belt drive, the former being for alternating current use. This is the most important inquiry sent out to the trade for many months and has been awaited with keen interest. It is by no means certain, however, that the matter will be closed at an early date, particularly as the railroad intimates that delivery may be as extended as 18 months. A rough estimate is that the list will aggregate close to $100,000; it calls for the following tools:

Lathes—One 80-inch driving wheel without quartering attachment; one 26-inch x 10-foot; one 32-inch x 12-foot; two 16-inch x 6-foot; one 14-inch x 6-foot; one 12-inch x 6-foot tool room; two 14-inch x 6-foot tool room; one 42-inch steel tired wheel lathe.

Turret Lathes—Two 3-inch x 36-inch; one 2½-inch x 24-inch; and one 6-inch turret lathe.

Brass Lathe—One 18-inch x 6-foot turret lathe.

Planers—One 72-inch x 32-foot frame planer; one 30-inch x 12-foot, four heads; one 42-inch x 20-foot, double head; one 42-inch x 10-foot double head; one 36-inch x 12-foot, double head; one 36-inch x 10-foot, four heads; one 36-inch x 12-foot, double head; one 48-inch x 12-foot, double head; one 36-inch x 10-foot, double head.

Crank Planers—Three with 20-inch x 20-inch x 20-inch stroke.

Shapers—One 24-inch stroke draw shaper; one 16-inch stroke shaper, tool room.

Slotters—One 3-head frame slotter, four frames for setting, 24-inch stroke; one 12-inch slotter; one 15-inch slotter; one 18-inch slotter.

Radial Drills—Two 5-foot; two 3-foot; one 4-foot.

Vertical Drills—One 44-inch; one 36-inch; one 24-inch; all heavy duty compound table.

Frame Drill—One 4-head frame.

Mud Ring Drill.—One 4-spindle.

Horizontal Drill.—One.

Friction Drills—Three 13-inch with capacity ¾-inch.

Plain Milling Machines—Two 14-inch x 6-foot.

Slab Millers—One 48-inch x 16-foot rod fluting; one 30-inch x 10-foot horizontal.

Vertical Milling Machines—One 42-inch vertical milling machine, height of spindle 25 inches; one 26-inch x 10½-inch rotary table 17 inches in diameter; one vertical milling machine, longitudinal feed 50 inches, cross feed 30 inches.

Universal Milling Machine—One No. 4, tool room.

Nut Facing Machine—One 2-inch.

Bolt Pointer—One 2-inch.

Centering Machines—One 4-inch; one 2-inch.

Pipe Nipple Machine—One ¼-inch to 2-inch.

Bolt Cutter—One double head ½-inch to 2-inch.

Port Miller—One cylindrical.

Vertical Lathes—Three 37-inch rapid production; one 37-inch rapid production for brass work, high speed.

Boring Mills—One 7-foot boring mill, 3 heads; one 48-inch car wheel boring mill.

Rod Boring Machine—One, double head.

Grinders—One 80-inch x 20-inch guide bar; one tool grinder, tool room; one reamer grinder, tool room; one cutter grinder, tool room; one die grinder, tool room; two twist drill grinders, tool room.

Keyway Cutter—One double head axle keyway cuter.

Hydraulic Press—One 25-ton hydraulic press for rod bushings.

Punches—One 72-inch throat punch; one punch and shear and 25-foot spacing table.

Hydraulic Flange Press—One large hydraulic.

Plate Planer—One 30-foot.

Hydraulic Gap Riveter—One 17-inch throat and 54-inch gap.

Flue Cutting-off Machine—One.

Flue Welding Machine—One double head welding machine.

Power Clamp—One boilermaker's power clamp, 12-foot.

Mud Ring Riveter—One portable.

Staybolt Nipper—One.

The above list, taken in connection with a list of some 20 machine tools on which the Norfolk & Southern is receiving bids for its shops at Berkley, Va., and some scattered inquiry from other lines, gives the situation a stronger tone, so far as the railroads are concerned, than it has experienced in some time. In other lines, inquiries are coming in only fairly well and the business being closed is generally light. Occasionally, however, an installation of some importance comes to light and serves to bring the aggregate of sales up to a fair figure. January business seems to have been only a little under that of December, which was perhaps the best month in the trade since the beginning of the depression.

The United States Metals Refining Co., 100 Broadway, New York, has contracted with the Arthur Koppel Co., 30 Church street, New York, for 100 standard industrial cars for use at Chrome, N. J. An order for 12 ore cars for the Industrial Securities Co., for use at its pyrites mines at Florence, Wis., has been taken by the New York office of the Youngstown Car Mfg. Co., which will also furnish several cars and considerable track equipment for work on the barge canal. Inquiries for industrial cars are reported as plentiful, a considerable number calling for export.

It is understood that the crane order for the Crane-Best foundry in the Pittsburg district, calling for about a half dozen machines, has been secured by the Morgan Engineering Co., Alliance, O. The crane requirements of the Otis Elevator Co. for its new foundry at Newburgh, N. Y., have not yet been placed. Inquiries are reported as fairly numerous and give promise of developing a larger proportion of orders than has been the rule for some time past.

The interests affiliated with the Western Maryland Coal & Coke Co., 2 Rector street, New York City, which are planning to develop power stations along the Youghiogheny river in Maryland, a short distance from the Pittsburg territory, have incorporated the Youghiogheny Power Co., with a capital of $100,000, to carry out the initial portion of this project. This matter has been referred to in this column from time to time. The eventual expenditure, if present plans are followed, may run close to $1,000,000. C. L. Pullen is located at the address given above.

L. Goldsmith & Sons, Canal and Cherry streets, Newark, N. J., manufacturers of trucks, have let contracts for the rebuilding of their plant, which was destroyed by fire some time ago. Work will be begun in the early future and the improvements will cost about $50,000.

CINCINNATI.

January Slightly Behind December, But Prospects are Encouraging.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., Feb. 2.

The month of January has not equalled expectations in the volume of business in machinery and machine tools and this perhaps accounts in some measure for the discontent expressed by manufacturers with the month's business. It can be said, however, that the close of the month was much better than the beginning and on the whole the record will not be far behind December in the matter of sales. The inquiry is keeping up remarkably well and there is hardly a day passes that the mails

do not bring some inquiry to each shop. These requests for information and prices are largely from users. There is talk in the trade of an order having been placed for a round lot of 100 lathes by a Chicago concern, but it is difficult to confirm this rumor. One of the shops which is reported to be running full with enough orders on hand for 90 days is credited with receiving this order, but it is denied by the company. In point of output the shops are running with fully as many men with about the same working hours as in December. There is every evidence that an awakening in demand is anticipated and preparations are under way to meet the calls for machine tools when order placing begins. Shops are being managed with a view to being able to make prompt deliveries on all stock sizes, so that if the machine is not actually on hand the parts will be made and the assemblying can be done quickly.

The Lunkenheimer Co. has purchased during the past week considerable equipment for its plant from two local concerns. It purchased a 16-inch lathe and a 24-inch lathe for tool room use. The company also bought four power presses from an eastern concern for pressed steel work, and is buying considerable foundry equipment, all of which has not yet been purchased.

Elmer E. McIntyre, of Pittsburg, was in the city the past week in conference with W. R. Tood & Co., in reference to the financing of a $500,000 corporation to manufacture a patented steel pulley and hanger. It is the intention of the company to build a big plant in either Ohio or Indiana.

The Cincinnati Steel Castings Co., of which William Gilbert, of the Buckeye Foundry, is president, will occupy the old plant of the Bruce foundry, on Kenyon avenue, and will be ready for operation by March 1. It is expected to begin with about 40 hands and with an output of about three tons per day.

The annual meeting of the Smith & Mills Co. was held last week. The following directors were elected: Alber S. Smith, James Mills, William Schuchardt, William Nentrup and Oscar Soden. The board organized by re-electing Albert S. Smith president and treasurer; James Mills, vice president and general manager; James E. Mills, secretary and Ernest Mills, manager and superintendent.

R. K. LeBlond and wife and Philip Fosdick with his wife and daughter, will be with a party making a Mediterranean trip, sailing from New York on Feb. 11. They expect to be gone about three months.

The Cincinnati Machine Tool Co. has had a very satisfactory month's business during January and reports the outlook as decidedly encouraging. Frank S. Baldwin, who has been with the company for several years, has resigned to accept the position of assistant to Mr. Freidlander, the president of the Hisey-Wolf Machine Tool Co.

At a banquet tendered the foremen of the Lodge & Shipley Machine Tool Co., Cincinnati, Mr. Lodge announced a new plan for profit sharing which will be put in operation by the company. The general employes are already working under a premium system, and the new plan provides especially for foremen and the so-called, non-producing employes, such as draftsmen, stock keepers, clerks, laborers, etc. Mr. Lodge's address will be published in a later issue of THE IRON TRADE REVIEW.

PHILADELPHIA.

Inquiry More Active, But Ordering Not Entirely Satisfactory.

Feb. 1.

Business conditions in the Philadelphia district, so far as the machine tool trade is concerned, continue rather erratic and the actual placing of orders is still so limited that it is difficult to determine whether or not there is actual improvement. On the whole, however, the manufacturers of machine tools are inclined to take an optimistic view of the prospect and several representative concerns report the situation as considerably stronger. Although not yet of large proportions, railroad purchases are apparently increasing. The Baldwin works recently secured an order from the Great Northern for 20 locomotives and a substantial increase in the order for the Central Railroad of Brazil, booked some time ago. Some increase is also noted in the call for heavy machine tools suitable for railroad work.

Instancing the above, the Hilles & Jones Co., Wilmington, Del., finds that since the first of the year conditions have improved materially, the railroads having come into the market to some extent. The line manufactured by this company includes plate shears and roller leveling machines for sheet and plate mills, for both of which orders have recently been received. The company has also booked orders for a half dozen sets of plate bending rolls, heavy guillotine frame bar shears and plate planers. Active inquiry is noted at present and there is less hesitancy in placing orders, although there is not yet the freedom in buying which makes the future dependable.

Henry Disston & Sons, Philadelphia, have placed contracts with the Chas. McCaul Co. for two additional buildings at their Tacony works, a two-story machine shop 84 x 184 feet, and a one-story warehouse, 43 x 91 feet. The cost is in the neighborhood of $50,000.

The city of Philadelphia is planning to install and has taken bids on a high-pressure pumping station at the corner of Lehigh avenue and Seventh street, to provide fire protection for the large industrial plants in that section.

The Tabor Mfg. Co., Philadelphia, reports its January business as better than during any previous month for a year or more and believes the outlook for business during the current year is very good. The company finds that the amount of business is increasing, though as yet it is rather erratic.

Harry R. Loche, Drexel building, Philadelphia, who with a number of associates has completed preliminary arrangements looking toward the acquisition of four operating coal mines along the C. & O. railway, reports that their entire output will be devoted to the manufacture of coke, for which some 2,000 ovens will be required.

Charles A. Vaughn, Millford, Del., has purchased the plant of the Gries & Sons Foundry & Machine Co. at that place, and has equipped it for the production of drop forgings, tools and dies.

Having taken title to a considerable tract at Twelfth and Washington streets, John Wyeth & Bro., Inc., manufacturing drugs and chemicals, are planning to erect a large concrete factory building.

The Eynon-Evans Mfg. Co., Philadelphia, states that inquiries are improving somewhat and that a fair amount of business has been secured for the pattern shop and foundry. The requirements of regular customers, however, continue to be greatly curtailed, and not much new trade is developing.

The Newton Machine Tool Works, Inc., states that the current condition of business is much better than has existed for the past year. While the actual volume of business closed is not rapidly increasing, inquiries now being received indicate a number of heavy purchases in the near future.

The Alabama Shovel Co., Gadsden, Ala., recently incorporated by Thomas Norris, Pell City, Ala., president; and Isaac Haas, vice president, is planning to erect a building 40 x 150 feet, for the manufacture of shovels.

PITTSBURG.

Placing of Orders Awaits Developments in Business World.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., Feb. 2.

Practically the same spirit on the part of buyers characterizes machinery lines. Figures have been asked and preliminary drawings made on a number of prospective installations, but the final closing of contracts is delayed until the outlook for future buiness is more clearly shown. There is at the same time a fair run of settled business appearing in the market, largely in the form of replacements and extensions, and some makers are noting a gradual increase in their orders. The roll makers report some improvement in their line.

The machine tool trade continues light and unsatisfactory. Little demand is being furnished by the railroads.

A contract of interest of the past week was the placing of a number of cranes for the new plant of the Crane-Best Co., at Oakmont, Pa. Considerable additional equipment is now being figured upon for these works.

The Lebanon Valley Iron Works, Lebanon, Pa., is building an addition 80 x 260 feet to its plant, and will install a new 18-inch bar mill and two new furnaces. The extensions will increase the capacity of the works to 150 tons daily.

Active construction upon the new steel works and finishing mills of the West Penn Steel Co., at Brackenridge, Pa., has been inaugurated. McKelvey & Hines, Pittsburg, have been awarded a contract for the grading of the site and for the concrete work. The Pennsylvania Railroad Co. has begun the laying of the switches.

The West Penn Railways Co., Connellsville, Pa., is planning the extensive enlargement of its main power plant. The company only recently completed the installation of considerable new power equipment in its plant.

The Westinghouse Machine Co., East Pittsburg, Pa., builder of the new model Roney mechanical stoker, reports a large business in boiler plant equipment for the last three months. The more important orders cover some 30 or 40 equipments for various types of boilers in many different classes of service. Of these, the government and state institutions have contracted for 17 stokers, namely the United States naval training station, Chicago; the Iowa state capitol; the Kentucky state capitol; central Kentucky asylum; the city of Owensboro, Ky., and the Iowa state college. The Public Service Corporation, Jersey City, N. J., has adopted this type of stoker as the result of detailed competitive tests between Westinghouse and other makes, 15 equipments being ordered for the present. Traction interests have also ordered equipments, including Kentucky Electric Co., Louisville, Ky.; Youngstown Heating Co., and the Nassau Light & Power Co. Further orders have come from the New York, New Haven & Hartford railroad, Readville shops, the National Tube Co., at McKeesport, which already operates a large number of Roney stokers, the Crescent Portland Cement Co., Wampum, Pa., the United Shoe Machinery Co., Boston, Mass., and the Newport Mining Co., Ironwood, Mich. Among the smaller isolated lighting plants may be mentioned the International Bureau of American Republics, Washington, the Iron City Improvement Co., Pittsburg, Pa., and the Century building, Cleveland. In a number of instances the improvements embodied in the new model Roney mechanical stoker have been considered of sufficient importance to occasion orders for change overs for remodeling their present stoker equipments along the lines of the new model stoker. A large number of trial orders are also being recorded for the purpose of trying out the new improvements.

The Morgan Engineering Co., Alliance, O., has been awarded the contract to furnish nine electric traveling cranes for the new plant of the Crane-Best Co., at Oakmont, Pa. The cranes are of the overhead type and range in capacity from 5 to 30 tons. Considerable additional equipment will be required for the new works, but as much of it is of special construction and design, many of the machines will be supplied by the Crane interests of Chicago.

SEATTLE.

Encouraging Orders for Power Plant and Saw Mill Machinery.

Office of THE IRON TRADE REVIEW,
302 Pioneer Bldg., Jan. 28.

Orders and inquiry for heavy power plant and saw mill machinery which presage a good spring business have stimulated the iron trade circles of the Pacific coast during the past week. The Hallidie Machinery Co., of Seattle, was given a contract by the Guggenheim interests for the entire power equipment to be used in the erection of the large steel bridges across the Copper river, Alaska, in extending the Copper River & Northwestern railway during the coming summer. The order includes five large air compressors for caisson work, seven erecting hoists, 1,000-horsepower boilers, complete electric light plant, pumps, etc., to the total value of $50,000. The American Bridge Co. was awarded the contract for the steel work in the bridges.

The Western Mills, on Lake Union, Seattle, which were destroyed by fire recently, will be rebuilt in the near future. The mill was one of the largest lumber manufacturing plants in Seattle and its rebuilding, immediately following the rebuilding of the Port Blakely mill, will add further strength to the demand for saw mill machinery.

The Copper River railroad, Alaska, will be extended 50 miles during the coming summer, according to the announcement made by M. J. Heney. Indications now point to a healthy demand for machinery, contractors' equipment and railway supplies in Alaska during the approaching season. The sales of mining machinery are expected to be considerably better than in 1908.

The Automatic Cattle Guard Co., Sand Point, Idaho, Chas. W. Palmer, president, announces that it will commence building a factory for the manufacture of cattle guards March 1, weather permitting. The company owns patents on a new design of automatic cattle guard for steam and electric railways which it purposes to manufacture and place on the market.

Inquiries for machinery from the Vancouver Car Works, W. H. Judson, manager, 818 Chamber of Commerce, Portland, Ore., indicate that this plant will be in operation during the coming summer. The company intends to erect a plant for the manufacture of all kinds of cars at Vancouver, Wash. It is expected that the plant will employ 150 men.

The Portland Sheet Metal Works, East Seventh and Madison streets, Portland, Ore., is building an addition to its plant made necessary by increasing business.

The McClintic-Marshall Construction Co., Pittsburg, is about to open a branch office in Seattle. The office will be opened for business as soon as a satisfactory location can be secured. Mr. Boyce will be in charge.

It is reported that David Smith, Blaine, Wash., will spend $5,000

equipping a machine shop and foundry to be located in Blaine. Another foundry and machine shop will be built at Wenatchee, Wash., by L. B. Frazier.

The Irondale Steel Co. has awarded the contract for the machinery for the new open-hearth plant at Irondale to the Moran Co., Seattle. The Irondale Steel Co. is building two 25-ton open-hearth furnaces and remodeling its blast furnace.

The city council of Seattle has passed an ordinance requiring all boilers used in the city to be of the butt joint and strap construction. The ordinance is very broad and requires every kind of boiler to be of this type. Machinery dealers are protesting that the ordinance works an unnecessary hardship and expense on the owners of all small boilers.

The Pacific Coast Metal Trades Association of British Columbia, which at the time of the iron molders' strike in Washington over a year ago did not join the open shop movement inaugurated at that time, will not formally renew its agreement with the Iron Molders' Union which terminated Dec. 31. There will be no changes in hours or wages, but the members of the association prefer to be free to deal with the men individually and not be bound by agreement with any labor organization. The usual rate of wages for molders in British Columbia is $4 for nine hours.

MILWAUKEE.

Normal Conditions Expected to Prevail by Spring.

Milwaukee, Wis., Feb. 1.—Machinery manufacturers expect that by early spring all of the leading plants of Milwaukee will be operated at normal capacity once more. It is generally admitted that business during the month of January has not reached quite the volume that was expected at the beginning of the new year, despite the fact that steady and gradual improvement has been made. Manufacturers say that this condition of affairs means that the improvement is on a healthy basis and that it has come to stay.

As a result of the development of the property of the Northwestern Iron Co., located at Mayville, Wis., three new companies were incorporated last week to care for the selling departments of allied interests. One is the Northwestern Light & Power Co., which will supply light and power to Mayville, Theresa and nearby points; another is the Northwestern Lime, Stone & Slag Co., a selling company to handle crushed stone and slag obtained from the Mayville properties, and the third is the Northwestern Milling Co. The Northwestern Lime, Stone & Slag Co. will enter the Milwauke and Chicago fields. The main offices of the Northwestern Iron Co. are located at Milwaukee.

Plans and specifications for a new steel and reinforced concrete bridge to cost $5,500 have been submitted to the city council at Waukesha, Wis., by the board of public works. Bids will soon be called for.

Charles Gaspar, who has had charge of the locomotive repair work at the Wisconsin Central railway shops at Fond du Lac, Wis., for the past two years, has completed negotiations with the Yueh-Hen, Canton-Hankow railway, with headquarters at Canton, China, and will be superintendent of motive power on the road. Mr. Gaspar goes to China under a two-year contract and is unusually well equipped for the duties of the new position.

GOOD RESULTS

Accomplished by the Cincinnati Industrial Bureau—Annual Meeting and Dinner.

The annual dinner and meeting of the Cincinnati Industrial Bureau was held in the Business Men's Club on Saturday evening, Jan. 23. The bureau has been in successful operation for eight years and since its organization has spent about $50,000 and brought to the city about 100 manufacturing industries, large and small. The dinner was attended by about 150 business men, largely manufacturers, with the iron and steel interests prominently represented. Si P. Egan, of the J. A. Fay & Egan Co., who has served the bureau as president the past year, presided. The work of the organization was outlined in the report of Will L. Finch, secretary of the bureau. He reported 247 contributing members on the books, which is an increase of 34 over the membership of 1907. Among the plants located through the bureau's efforts was the Ohio Bevel Gear Co., which was subsequently consolidated with a local concern and is now known as the Cincinnati Gear Co. The company was originally composed of three of the heads of departments of a Philadelphia concern. A partnership concern consisting of Messrs. Griffith, of Rockford, and Crist, of Beloit, Wis., came from Rockford, Ill., and located here for the manufacture of cone pulleys. The Phillemac Rolling Mill Co. now occupies the old plant of the old Brackett Bridge Co., engaged in the manufacture of bar iron, through the instrumentality of the bureau. The United States Can Co. is now building a large plant in Norwood. This new industry is being looked after by O. C. Huffman, president of the Virginia Can Co., of Buchanan, Va. An effort was made to secure the plant of the Reeves Engine Co., of Trenton, N. J., and the Pike Adding Machine Co., of Orange, N. J., but the failure to interest local capital in extensions to these enterprises was responsible for the inability to secure them for Cincinnati. One automobile company was secured, which moved here from Bedford, Ind., and is now known as the Buggycar Co. The Crown Mfg. Co., maker of iron beds, moved here from Atlanta, Ga. The Cincinnati Steel Foundry Co. is another new industry. A number of other concerns were mentioned outside of the iron and steel field.

Thomas C. Powell, vice president of the Cincinnati Southern Ry., was one of the speakers and urged upon Cincinnati the necessity of aggressive work in developing trade with the south. A number of the manufacturers present made short addresses.

The meeting was regarded as one of the most successful the bureau has held. The report of the secretary indicates the affairs to be in excellent condition, and the work is becoming increasingly effective, through the many lessons learned by experience.

Declaration of Principles.—The American Supply & Machinery Manufacturers' Association recently agreed upon a declaration of principles which it is sending to its members and others interested. The association believes that the time has come for a firm and determined stand on the vital questions that confront every manufacturer in the country—unfair competition, quality maintenance and profit production. The association will carry on an active campaign to enlist the support of all dealers and manufacturers.

Victor R. Browning & Co., Cleveland, are furnishing 24 Armington hoists to the Pressed Steel Car Co., Pittsburg, and also are building a bundle carrier for Botany Worsted Mills, Passaic, N. J. They have just shipped a dredge to Mexico for digging irrigating ditches.

THE MAHONING VALLEY AS AN IRON CENTER

STEEL DRIVES IRON PRACTICALLY FROM STRONGHOLD

Attempt to Manufacture Steel in Siemen's Furnace Was Not Successful—Mill Owners Organize Ohio Steel Co. as Protection Against Pittsburg—Sheet & Tube Co. Harks Back to Puddled Iron

By Joseph F. Froggett.

(A sketch of solely the pioneer history of the Mahoning Valley from 1808 onward, including the building of the first blast furnaces, rolling mills, etc., up to Civil war times, was published in the issue of Jan. 21.

The development of the older plants, expansion of the sheet industry into tin plate manufacture, etc., was sketched in the issue of Jan. 28. This is the concluding number of the series.—Ed.)

III. THE STEEL PERIOD.

Modern Plant Construction.

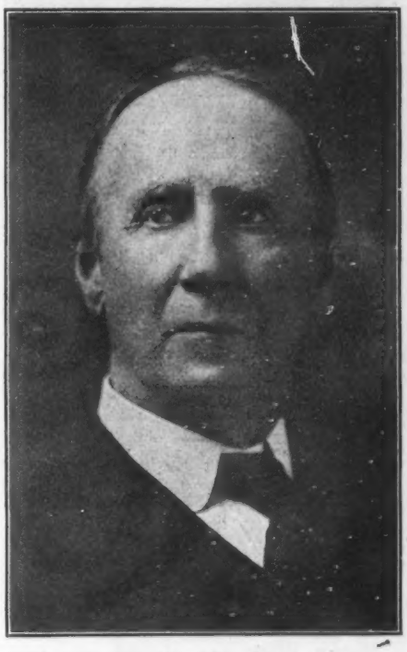
For several years, steel in the shape of the smaller sized billets had been worked throughout the various mills of the valley into finished products, but up until 1883, no effort had been made to make steel itself in the Mahoning valley, Pittsburg furnishing by far the larger bulk of the raw product which was used in the district. In 1882, however, the Youngstown Steel Co., which was organized with John Stambaugh Sr., president, Paul Jones, secretary and treasurer, E. L. Ford, superintendent, built and put into operation March 1, 1883, the first steel plant of the valley. The officers of the company afterward were: President, John Stambaugh; vice president, George Tod; secretary-treasurer, John Stambaugh Jr.; business manager, Tod Ford; superintendent, E. L. Ford. Mr. Ford had been secured in 1882 from the Edgar Thomson works by the Brier Hill Iron & Coal Co. to operate a small furnace which the Brier Hill company had built for the purpose of making spiegeleisen with imported Spanish ore. When it was found that spiegeleisen could be imported cheaper than it could be manufactured at Brier Hill the project was abandoned. One 20-gross-ton Siemens open-hearth steel furnace was established and the plant produced some open-hearth ingots. However, the venture did not prove successful and the works were shortly afterward abandoned. The Youngstown Steel Co. then established at Brier Hill a plant containing one 10-ton Pernot revolving furnace for de-phosphorizing metal by the Krupp-Bell process, and having a yearly output of 40,000 tons of "washed metal." It first purchased its pig metal cold from the Brier Hill Iron & Coal Co., later buying the Tod stack. Upon the greatly regretted death of John Stambaugh Sr., in 1888, Tod Ford became president and general manager and Paul Jones vice president, the other officers remaining unchanged. Early last year E. L. Ford was elected president, following the death of Mr. Ford, who had retired from active participation in business for some years previously. John Stambaugh Sr. was succeeded as president of the Brier Hill Iron & Coal Co. by George Tod, son of the first president. Mr. Tod died Nov. 16, last year, and H. H. Stambaugh was chosen in January, this year, to fill the vacancy.

The first steel sold by the Youngstown Steel Co. was to the Joliet Steel Co., Joliet, Ill., of which A. J. Forbes-Leith was then president. The former Joliet steelmaker is now Lord Fyvie, of Fyvie Castle, Scotland. The Youngstown company was the first in the valley to install a "skip" hoist at its stack, steam elevators having been employed up to that time. Now the new hoist is generally employed.

The Ohio Steel Co.

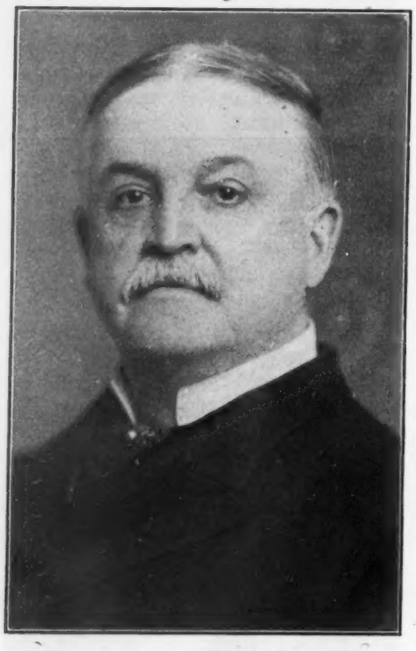
The Ohio Steel Co. was organized in August, 1892, for the purpose of building a Bessemer steel plant in Youngstown. It was the pioneer Bessemer steel manufacturer in the valley. As the consumption of Bessemer steel had grown, the blast furnaces of the locality, which in former years had furnished to the neighboring rolling mills the pig iron to be used in their puddling furnaces, had been shipping more and more pig metal to Pittsburg, where it was converted into steel and returned in the form of billets to the rolling mills in which it was superseding bar iron. This put both the blast furnace men and the rolling mill men of the valley at the disadvantage of the freight charge to and from Pittsburg as compared with the nominal cost of transfer if the steel could be made at home. The building of such a steel plant

Edward L. Ford.
President of Youngstown Steel Co.



Paul Jones.
Vice president Youngstown Steel Co.

had been repeatedly suggested and the organization of the company was consummated in the summer of 1892 as stated. All the leading manufacturers, including the Union Iron & Steel Co., the Brier Hill Iron & Coal Co., the Youngstown Steel Co., the Mahoning Valley Iron Co., and the Andrews Bros. Co., joined heartily in the undertaking. The original capital, to the amount of about $600,000, was subscribed by men connected with these concerns and other residents of Youngstown. The directors were: Henry Wick, Myron C. Wick, Jos. G. Butler Jr., Edmond L. Brown, L. E. Cochran, Edward L. Ford and H. O. Bonnell.



HENRY WICK.
Formerly president Ohio Steel Co.

Henry Wick was elected president and given power to do whatever was necessary in the conduct of the business. William H. Baldwin, now of Washington, D. C., was elected secretary in April, 1894. J. G. Butler Jr. was made vice president, but was never directly connected with the management of the business, although aiding the project materially throughout its history. Steps were immediately taken to secure a site and begin building, and this was done on lands west of the city and immediately across the Mahoning river from the Brier Hill Iron & Coal and Youngstown Steel Cos.' furnaces, notwithstanding the fact that the election in November of that year, with the prospective disturbance of a change in the tariff, made the outlook for the industry far from encouraging. One of the largest stockholders, prudently as he thought, sold his stock in order not to be involved in the trouble, if such a reverse, as often happens to new concerns, should take place.

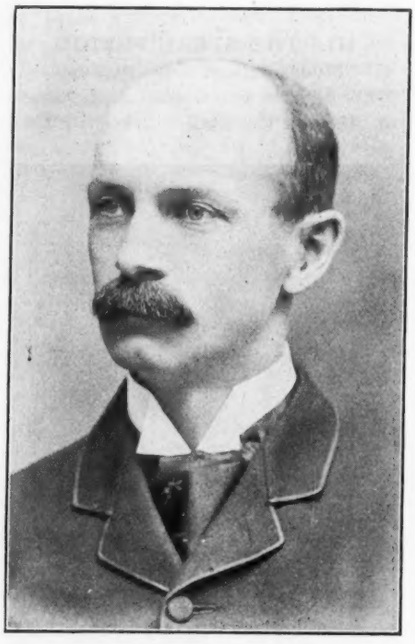
The Project Grew.

Notwithstanding this, the work was carried on with Julian Kennedy as engineer. The original plans contemplated converters of about eight tons capacity to blow side by side; but after Thomas McDonald came as general superintendent, these plans were, by his advice, changed to 10-ton converters, blowing back to back. This change necessitated heavier machinery and appliances throughout and caused some delay in the progress of the construction.

It was not at first intended to do more than roll 4 by 4-inch billets in a blooming mill of the usual pattern. But as the mills which were to use the steel required smaller billets, it was determined after considerable deliberation to add a mill which would not only reduce these billets to a section of 1½ inches by 1½ inches, but would also roll rails or the bars needed for the manufacture of sheet steel and of tin plate which were coming more and more into demand. It was estimated that the construction of this mill would cost about $400,000, and with the aid of some wealthy men outside of Youngstown the capital was increased first to $750,000, and afterwards to $1,000,000.

With the usual delays in construction, and particularly because of the desire to have everything as well built and substantial as possible, the completion of the plant took far more time than had been expected at the beginning, and it also became apparent that the capital would not by any means cover the cost of its construction on the scale and in the manner proposed. The enterprise seemed so large to those who had undertaken it that they were unwilling to put in more money directly, but a three years' loan of $250,000 was secured from the stockholders on Jan. 1, 1895, by giving them the privilege of converting it into stock if desired at any time prior to Jan. 1, 1898. Conditions had so changed at the latter date that all the notes were converted and the capital increased to $1,250,000, at which it stood when taken over by the National Steel Co. in Feb., 1899.

When the work was far enough completed to start the plant on Feb. 4, 1895, the temperature was 4 degrees below zero, but all was in readiness and the first heat of 10 tons of steel was successfully blown. When, however, the blower attempted to turn the vessel down, he found that there was no pressure on the line. He had sufficient presence of mind to let the converter rest as it stood. The crowd of spectators which had gathered little realized how near they came to being blown into eternity by the explosion which would have been caused if the mass of molten steel had been suddenly dumped onto the damp, frozen ground. It was found that the extreme cold had caused a break in one of the main pressure lines while the heat was being blown, but this was promptly closed, the steel poured into ingots and sent through the mill without further difficulty.



WILLIAM H. BALDWIN.
Formerly secretary and treasurer of Ohio Steel Co.

There were of course the usual delays in starting up and the very dull condition of the market increased the difficulty of running the plant successfully. But the demand for sheet bars which the plant was fitted to make, as well as small billets and the ordinary 4-inch billets, was growing and particular attention was paid to this, some tin plate concerns buying their first steel from the Ohio Steel Co. and continuing to use its bars almost exclusively from that time on. The bars were made from the best pig metal the company could get and selected with the utmost care. Not having blast furnaces to supply it, the pig metal came from a dozen of furnaces in the two valleys, but in each case nothing was accepted which was not strictly within the Bessemer limit; and

the wisdom of insisting on this became apparent in the preference which the company received for its bars from those who had used them.

Proved Its Efficiency.

The plant was strongly built throughout and no important changes were found to be necessary in its construction. The boiler capacity proved to be insufficient, but was promptly enlarged and after the men in the organization became accustomed to their duties, the mill ran along well. During the 16 months ending with October, 1899, 832 turns were possible, counting out Christmas, Fourth of July and Sundays; and out of the 832 the mill ran 822, proving in this way not only the excellence of its design, but also the efficient way in which the machinery was kept up under Thomas McDonald's superintendence. This continuity of operation was also due in part to an excellent general organization; and the stability of this was shown by the fact that at a dinner given to Mr. Wick, Mr. Baldwin and Mr. McDonald by the various foremen at the works, on the third anniversary of the plant, at which nearly 40 men sat down, it was noticeable that all except one had been with the company since the plant started, the exception being the man who took the place of the master mechanic who returned to his former position at Homestead not long after the Ohio plant was put in operation.

The slack demand in 1896 had interfered with the steady operation of the plant which made only about 25,000 tons during the four months from August to November inclusive, the output in August being only 3,373 tons. But from July, 1897, the demand was better and during the remainder of that year and the next, the output did not fall in any month below 30,000 tons, reaching 39,368 tons in November, 1898.

By the latter part of 1897, it became apparent to those in charge that a very great saving would result from the construction of blast furnaces, particularly the saving which the use of hot metal would give. A careful investigation indicated that two large furnaces, modern and well equipped, could be built for $1,200,000, and that aside from any profit in the manufacture of the metal there would be a saving in the cost of conversion, in the steel plant, of at least 75 cents per ton on account of using the hot metal direct from the furnace. A statement of these facts was duly made to the board of directors, but instead of being enthusiastically endorsed it was received in silence. This was finally broken by J. G. Butler, Jr., who said that having been annoyed by the proximity of a chicken-yard he had, as a member of the city board of health, recommended at a meeting recently held that a measure be adopted forbidding the keeping of chickens within the city limits. He stated this request, which seemed to him entirely reasonable, had also been received in silence and then he had found that most of the other members of the board kept chickens. As a majority of the directors were immediately interested in the furnaces which were selling their product to the steel plant which had been built for that purpose, the story was so apropos that it caused a general laugh. The proposition was, however, discussed on its merits and the advantage of building the furnaces so plainly shown that steps were at once taken

JOSEPH G. BUTLER, JR.
General manager of Brier Hill Iron & Coal Co.

to issue bonds to the amount of $1,000,000, running 10 years from June 1, 1898, and with the proceeds of these pay for the construction of the furnaces which were immediately started. The first bonds were issued in August, 1898, and the remainder prior to March 1, 1899.

Improved Type Construction.

The furnaces as planned were the largest in the world at the time they were put up, being 106½ feet in height by 25 feet in bosh, with four stoves, each 118 feet by 21 feet. The blowing engines were specially designed by the William Tod Co., the first of the type which has since been installed by so many other furnace men. The work was pushed forward as rapidly as possible, but in the crowded condition of the business during the succeeding year there were many unavoidable delays and it was not until Feb. 15, 1900, that the first iron was made in the furnace first started, followed by that from the second June 7, 1900.

Sometime toward the latter part of 1898, after the formation of the American Tin Plate Co., which consolidated the principal tin plate manufacturing companies, a suggestion that the steel plants manufacturing billets and sheet bars be consolidated was made, with a proposition for taking over the Ohio Steel Co. Some of the principal stockholders had never seemed to appreciate either the plant or the work it had done, and the suggestion of selling it at a price beyond what any of them had ever thought of its being worth was favorably received. These negotiations were completed and the company became part of the National Steel Co., in the latter part of February, 1899, the principal offices being at that time removed from Youngstown to Chicago. Henry Wick had continued as president and W. H. Baldwin as secretary and treasurer and there had been few changes in the board of directors which at the time of transfer consisted of Henry Wick, E. L. Ford, Myron C. Wick, George D. Wick, James Parmelee, J. G. Butler Jr., E. L. Brown, Henry Stambaugh and J. L. Botsford.

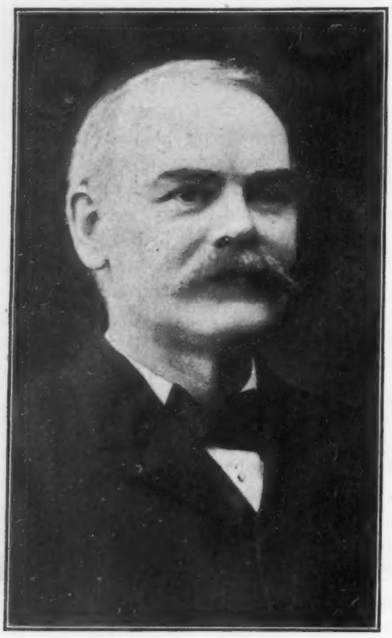
The change, with plenty of capital available, gave the company a new outlook and a third furnace was started very soon afterward, in which the first cast was made March 29, 1901. The company had always expected to make rails when in position to spend the money for the additional plant necessary; and plans for this were immediately carried into execution, the first rails being rolled on May 14 of the year following. The manufacture of rails with the sheet bars gave that part of the mill plenty to do and the change from either to small billets involved some expense and loss of time. To obviate this and increase the output a continuous mill for the manufacture of small billets was installed by which that portion of the product which had hitherto gone into 4-inch billets could as well be reduced to those of smaller size and either sheet bars or rails be made at the same time. The officers of the National Steel Co. at the time it was formed were: President, William E. Reis; first vice president, Henry Wick; second vice president, R. M. Gilbert; treasurer, F. S. Wheeler; secretary and auditor, William H. Baldwin.

The equipment of the Ohio works just prior to absorption by the Car-

negie Steel Co., in March, 1903, included: Nos. 1, 2 and 3 blast furnaces, 500 tons daily capacity each; converting mill:—one 250-ton hot metal mixer, five cupolas, two 10-ton converters, 34-inch blooming mill, 23-inch finishing mill, 16-inch continuous mill, and one rail finishing mill.

The equipment added under the Carnegie Steel Co. and now in operation includes: No. 4 blast furnace, 500-ton daily capacity; and one 250-ton hot metal mixer. The 34-inch two-high blooming mill was replaced by a 43-inch three-high blooming mill.

The equipment added under the Carnegie Steel Co., now in course of construction includes: Nos. 5 and 6 blast furnaces of 500 tons daily capacity each; one 250-ton hot metal mixer for open-hearth furnaces; 12 open-hearth furnaces with a capacity of 1,800 tons per 24 hours; one 40-inch slabbing mill, and one new machine shop to replace the old one. Power equipment: One 1,000-kilowatt electric gas engine, built by the William Tod Co.; four 42 x 60 x 80 gas blowing engine, twin tandem 14-stroke cycle, built by the William Tod Co.; and four 42 x 60 x 80 electric gas engines twin tandem 4-stroke cycle, built by the Snow Steam Pump Co. Joseph A. McDonald, who has been with the Ohio works for a number of years, is superintendent of the Ohio works and furnaces.



THOMAS MCDONALD.
General superintendent, Youngstown district, Carnegie Steel Co.

Era of Consolidation.

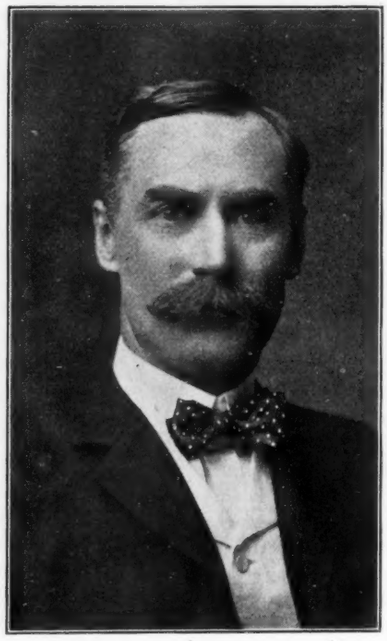
The year 1899 will always be associated in the minds of American iron and steel masters with the most interesting series of formations of large corporations in the history of the industry in the United States. Every large plant in the Mahoning valley was concerned in this industrial combination. On Feb. 1 of that year, the Union Iron & Steel Co. was bought by the National Steel Co.; on May 3 of that year, the Republic Iron & Steel Co. was formed, taking in the Brown & Bonnell plants, the Andrews Bros.' plant at Haselton, the Mahoning Valley plant, the Hannah and Haselton stacks, an interest in the Union Limestone Co. at Lowellville and the Lake Erie Limestone Co. at Carbon, Pa. In the list of officers of the Republic company in 1898 and 1899 were the following names of Mahoning valley iron manufacturers:

Board of Directors—Myron C. Wick, John F. Taylor, L. E. Cochran and George D. Wick; executive committee, chairman, Myron C. Wick, John F. Taylor and George D. Wick; first vice president, George D. Wick; treasurer, John F. Taylor; manager the order department, J. M. Butler. The Mahoning valley officers were: District manager, James A. Campbell; district treasurer, H. W. Heedy; manager of valley furnaces, Charles I. Rader; manager of the gas belt district, Muncie, Ind., W. L. Simonton.

In the meantime, the old Phoenix and Falcon stacks had been dismantled, and on the site of the latter plant in 1900 was built a Bessemer steel plant, with converters and a blooming mill which had formerly made up part of the equipment in Alexandria, Ind., and Springfield, Ill., works. Both were entirely rebuilt, the equipment increased, and the first steel was blown in September, 1900. In 1901, W. E. and John F. Taylor were the only Youngstown men left in the Republic's directory, John F. Taylor being also treasurer. Thomas Parrock was superintendent of both the Brown-Bonnell and Valley plants; J. W. Deetrick was superintendent of the Hannah stack and Charles Hart, of the Haselton stacks. W. E. Taylor was succeeded as general manager by W. L. Simonton; he by Charles Hart; and he in turn as general superintendent by J. W. Deetrick, who still occupies that office. In 1905 vast improvements to the blast furnace department were made. Haselton stack No. 2 was built and blown in Oct. 3, 1906, and stack No. 3 was built and blown in in January, 1907. The first steel rail was rolled at the Bessemer department April 22, 1905, and the first sheet bar rolled in May of that year. All the puddle mills of the old Brown-Bonnell plant had been dismantled except No. 4, and the Haselton mill was dismantled in 1905, leaving the Mahoning Valley plant the only one of the Republic company producing exclusively iron bars in the Mahoning Valley.

In 1898 the Continental Iron Co. was formed by Henry B. and J. D. Shields, including the plants of Coleman, Shields & Co. at Niles, which had once formed part of the extensive works of James Ward & Co.; the Stewart Iron Works, Sharon, Pa., and the Wheatland, Pa., mill. In 1900 the properties of the company had passed into the hands of W. D. McKeefrey, trustee in bankruptcy.

Specialization of finished products then became the order in the Mahoning Valley. The Youngstown Iron & Steel Roofing Co., with president, L. E. Cochran; vice president, G. M. McKelvey; secretary, C. A. Cochran; treasurer, Mason Evans, and manager, John O. Pew, built near Haselton in 1901 and first put in operation on Sept. 4 of that year a mill with an annual capacity of 20,000 gross tons of sheet iron and sheet steel. A galvanizing plant was also run in connection with it. In 1904, Mr. Pew had been chosen vice president and general manager of the company.



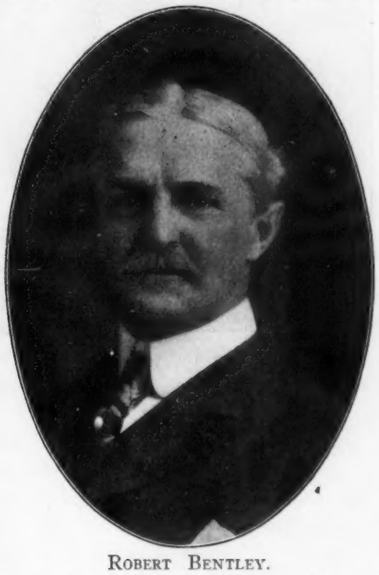
JAMES A. CAMPBELL.
President of Youngstown Sheet & Tube Co.

The Niles Iron & Sheet Co., having as officers, president and manager, James S. Paterson, vice president, H. M. Robinson, and secretary-treasurer, W. A. Thomas, built at Niles, O., in 1901 and first put in operation in May of that year mills with an annual capacity of 12,000 gross tons of black sheet

steel. In 1907 the name of the company was changed to the Niles Iron & Steel Co., with these officers: President, W. A. Thomas; vice president and treasurer, C. L. Thomas, and secretary, C. R. Thomas. Feb. 1, this year, it became the Thomas Steel Co.

The manufacture of tin plate, while carried on successfully at Niles, never became a success in Youngstown. In 1893 the Youngstown Tin Plate Co. began the erection of a plant at Youngstown, put up one set of Morewood pots and had an engine partially erected when work was suspended and the plant site purchased by an electric supply house.

The Alcania Tin & Terne Plate Co., built in 1896 a plant with a weekly capacity of 1,750 boxes of tin and terne plate. The company had these officers: President, W. S. Collier; vice president,



ROBERT BENTLEY.
President of Ohio Iron & Steel Co.

W. T. Lewis, secretary and manager, T. H. Jeremiah. The plant was removed in 1899 to Avonmore, Westmoreland county, Pa.

Sheet and Tube Plant.

The present proportions which the plant of the Youngstown Sheet & Tube Co. has reached exclusive of the extensions now under construction, completely refute the truth of the observation commonly made after the industrial combinations of 1900 and thereabouts had been completed that "there is little chance of success nowadays for independents." From a comparatively small plant in which it was first proposed to manufacture strictly iron specialties which would not come into competition with "combine" products, it has grown so rapidly that in December just passed the board of directors recommended to a vote of the stockholders a proposition to increase the capital stock from $6,000,000 to $10,000,000, since the latter figure would represent more nearly the real value of its various mills, steel plants and furnaces.

Firm in the belief that a mill for the manufacture of "old fashoned iron" sheets would be a profitable venture in face of the fact that steel sheets because of their comparative cheapness had driven sheets of puddled iron practically out of the general market, James A. Campbell interested Youngstown capitalists in his plan. Mr. Campbell had first entered the iron business as superintendent of the Trumbull Iron Co.'s mill at Warren, O., in 1890. After the consolidation of the various plants into the Union Iron & Steel Co., with Myron C. Wick as president, Mr. Campbell was appointed manager of the company's mills at Pomeroy, O., for two years and a half. In 1895 he was named general superintendent of the Mahoning Valley Iron Co., and when the Republic Iron & Steel Co. was formed he became manager of the Youngstown district, including the three local plants, the Buhl mill at Sharon, Pa., and a mill at New Castle, Pa. This office he held for two years. Among others whom Mr. Campbell consulted respecting the proposed sheet iron mill was George D. Wick, then located in Chicago as vice president of the Republic company, but anxious to be at home with his family in Youngstown. Mr. Wick proposed that the capital of the company should be enlarged and the manufacture of pipe was added to that of sheets. The company was incorporated as the Youngstown Iron, Sheet & Tube Co., and Mr. Wick was chosen president and treasurer; Mr. Campbell, vice president and general manager; W. H. Foster, secretary, and William C. Reilly, auditor.

The original plant built in East Youngstown in 1901-2 included 14 double puddling furnaces, 10 heating furnaces and 6 hot mills and was first put in operation in February, 1902. The first pipe was made in July and the skelp mill started in December following. A galvanizing plant was added as well as a foundry for gray iron castings for the company's use. The company was capitalized at $600,000 and it was the original intention to confine its output largely to iron products. Afterward believing it desirable to enlarge the plant, the projectors increased its capital to $1,000,000. This was later increased to $2,000,000 as the building of various mills progressed in obedience to the demands of expanding trade. When it was decided to add an open-hearth department the capital was again increased, this time to $4,000,000. Investigation of the manufacture of open-hearth steel into merchant pipe led to the decision that it would be more desirable immediately to adopt the Bessemer process, which was done. The building of the two blast furnaces was decided upon, the Alice stack at Sharpsville, Pa., having been previously bought from Pickands, Mather & Co. This brought about another increase in capitalization to $6,000,000, all of which was paid in cash. The company did not pay any dividends for the first two years, in fact, did not earn any for some little time. But later on the earnings were put back into plant account until

JAMES H. NUTT.
Secretary of the Western Bar Iron Association.

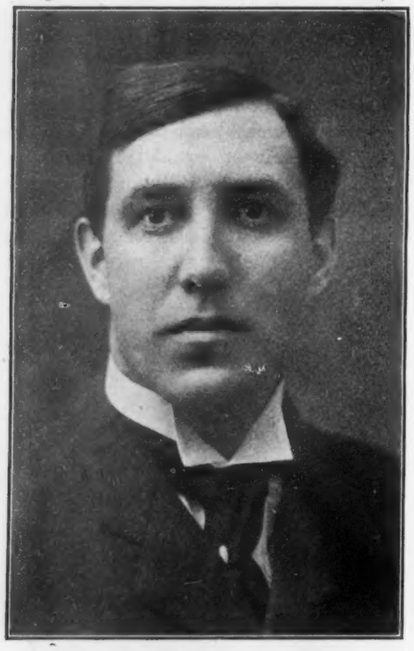
at the present time there is invested about $12,000,000.

About two years after the organization of the company President Wick's health became affected and he resigned and went abroad for about a year. The company was without a president for a year and a half when Mr. Campbell was chosen to fill that office. George E. Day was secretary and general sales manager, and Richard Garlick secretary. The withdrawal of Mr. Wick from active participation in the affairs of the company was greatly regretted, since it was due much to his efforts that the plant was enlarged as well as due to his reputation, acquaintance and ability that the company was able to secure the necessary financial support throughout its early formative history.

In addition to the plant which the company built itself, last spring it purchased from the Morgan Spring

Co. a rod, wire and nail mill plant located at Struthers, O., which is being enlarged by the new owners. This plant had been originally built in 1902 by the Youngstown Mfg. Co., for the manufacture of nuts and bolts, passing to the Morgan Co. in 1905.

The officers of the Youngstown Sheet & Tube Co., as it is now, the word "iron" having been dropped



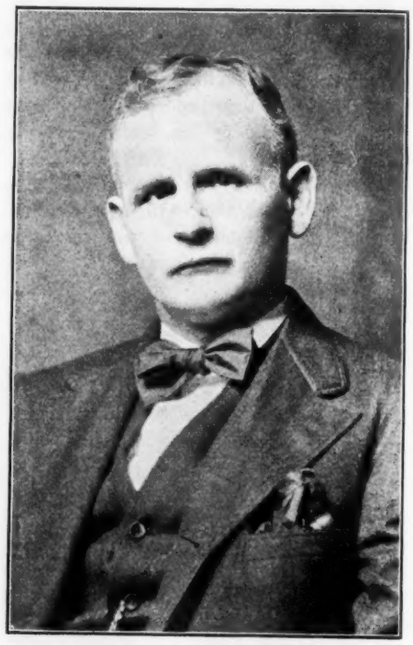
J. W. DEETRICK.
General superintendent of Republic Iron & Steel Co.

from the original name, include those enumerated last above and these additional: First vice president, H. G. Dalton, Cleveland; second vice president, C. S. Robinson; auditor, W. B. Jones; general superintendent, William C. Reilly.

A unique organization of the rolling mill owners of eastern Ohio and western Pennsylvania was effected in 1883-84, known as the Mahoning Valley Iron Manufacturers' Association, into which the Shenango valley manufacturers were later admitted. The first secretary was J. H. Sheadle, who served for two years, or until his removal to Cleveland. It was primarily organized for the purpose of bringing about exchanges of views of the various rolling mill owners with a general objective of more compactly dealing with the various wage scales and the usual mill disputes of minor importance with their employes. These were then almost without exception, especially among the skilled men, members of the Amalgamated Association of Iron, Steel & Tin Workers. The Valley Manufacturers' Association at its maximum represented 25 different iron and steel concerns employing 20,000 men, and was only dissolved when most of the companies were absorbed by the formation of the various steel companies of 1899 and 1900.

James H. Nutt, himself a practical mill man, was engaged by the association as its secretary in May, 1892. Upon him devolved the labor of arranging many of the minor mill disputes and of preparing and carrying out, with the co-operation of the executive officers of the various companies represented, the preparation of the wage scale from year to year. This involved a great deal of careful preparation of tonnage figures and prices which go to make up the involved wage scale as printed. The annual meetings between the wage scale committee of the Amalgamated Association and the members of the Manufacturers' association held at Youngstown for a number of years centered upon the valley the attention of rolling mill proprietors throughout the United States, for the wage scale there agreed upon formed the basis for like agreements between employers and employes of rolling mills throughout the country.

Mr. Nutt became labor commissioner for the Republic Iron & Steel Co. after the organization of the company in May, 1899, and continued to hold that position until Jan. 1, 1906. Then he was chosen secretary of the



F. B. BAUGH.
Superintendent of Carnegie Steel Co.'s steel hoop mills in Youngstown.

Western Bar Iron Association, which was organized at that time by the independent bar iron manufacturers. He is still secretary of the Western Bar Iron Association, of which Simpson C. Leonard, a former employe of the Youngstown rolling mills, and now general superintendent of the American Car & Foundry Co., is president. George M. Clark is vice president.

STEADY GROWTH OF A PIG IRON FIRM.

The announcement made by Hickman, Williams & Co., of its absorption of the business of N. S. Bartlett & Co., of Boston and New York, is interesting as revealing the development of a business, inconspicuously begun 18 years ago, and originally localized to the Louisville territory, into a national organization. In 1891, a partnership was formed between R. B. Hickman and H. L. Williams, the basis of it being a somewhat uncertain privilege to sell a certain brand of pig iron to a restricted number of foundrymen in the Louisville territory whom the authorized agent for that district had never been able to induce to become regular customers therefor. With this flimsy connection as a beginning, leavened with a lot of hope but little experience, the partnership made a shy debut and at once backed out of the lime light. However, with fostering care, the firm prospered. It was audacious in its operations and adventurous in its risks.

In 1898 it was sure enough of its ground to hazard a Chicago office. H. L. Williams came north and opened it. Originally it comprised desk room; now it occupies a suite of several rooms, and E. P. Hettiger is associated with Mr. Williams in the management of the office and territory. Two years after the opening of the Chicago branch, an office was established in St. Louis, Ben P. Williams being placed in charge there. Four years later, or in 1904, the company opened an office in Cincinnati which was placed in charge of F. M. Eaton, formerly with the Virginia Iron, Coal & Coke Co., who was at the same time admitted into the partnership. A year later, it became necessary to establish an office in Pittsburg, and Coleman Ward was made manager there. The next enlargement of the firm's activities is embodied in the announcement printed in the Jan. 28 issue. By this step, Hickman, Williams & Co. acquired the business, connections and offices in Boston, New York and Philadelphia formerly identified with the firm of N. S. Bartlett & Co. John O. Henshaw, formerly a partner in this concern, being made a partner in the absorbing company, with headquarters in New York City.

THE WORKS OF THE INDIANA STEEL CO.—II

This Article Describes the Blowing Engine and Power Plants of the Great Works at Gary—Gas Driven Units Used Exclusively, With Steam Driven Auxiliaries

In the preceding article of this series, a diagram, Fig. 30, was presented showing the proportion of gas distribution to stoves, boiler houses, blowing engines and power station. The total production of gas for eight furnaces was given as 22,450,000 cubic feet per hour, or at the rate of 150,000 cubic feet per ton of pig iron produced. This is in accord with practice where a high fuel consumption is necessary, but with a fuel consumption of 2,000 pounds of coke per ton of pig iron and working on our Mesabi ores, the gas production may be easily as low as 123,000 cubic feet per ton of pig iron. Assuming this as a minimum gas production, it is interesting to note the actual gas requirements of the stoves and the portion that remains available for use in the boiler and power department.

The amount of gas required to heat the stoves is determined by the quantity of air to be heated. The cubic contents of the Gary stacks, in round numbers, is 18,750 cubic feet. Assuming the ratio

$$\frac{\text{cubic feet of air per minute}}{\text{cubic feet of contents}} = 2,$$

we have as the necessary volume of blast, 37,500 cubic feet per minute. About 60 cubic feet of air is required to consume a pound of coke, upon which basis it may also be shown that a 450-ton stack with a fuel consumption of 2,000 pounds will require 37,500 cubic feet of air per minute. As previously stated, the maximum opening of the tuyeres of these furnaces is sufficient to admit 46,200 cubic feet of air per minute (equivalent to 2,250,000 cubic feet per hour) which would weigh 171,765 pounds. To raise the temperature of this volume of air from 60 degrees to the ordinary blast temperature of 1,200 degrees Fahr., would require 50,842,540 B. T. U. per hour. This heat plus 10 per cent for radiation losses, or 55,926,000 B. T. U. in all, is supplied by four stoves.

The heat capacity of fire brick is about 0.2 B. T. U. per pound of brick per degree drop in temperature per hour. A McClure stove, such as is installed at Gary, contains, approximately, 395,000 9-inch brick (each weighing eight pounds), or 12,640,000 pounds of brick in four stoves. Dividing 55,926,000, the heat required to be furnished, by $0.2 \times 12,640$, we find that the stoves will heat the blast with a temperature drop of only 22.12 degrees, where nearly 100 degrees drop is permissible. The heating surface is shown to be considerably on the safe side. In determining the amount of gas required to supply the necessary heat, we find that one pound of blast furnace gas coming from the furnace yields about 90 B. T. U., to which is added 1,060 B. T. U. developed in burning one pound of gas making a total of 1,150 B. T. U. per pound of gas. The heat losses in products escaping from the stoves at a temperature of 600 degrees Fahr. amount to 270 B. T. U., or 23.47

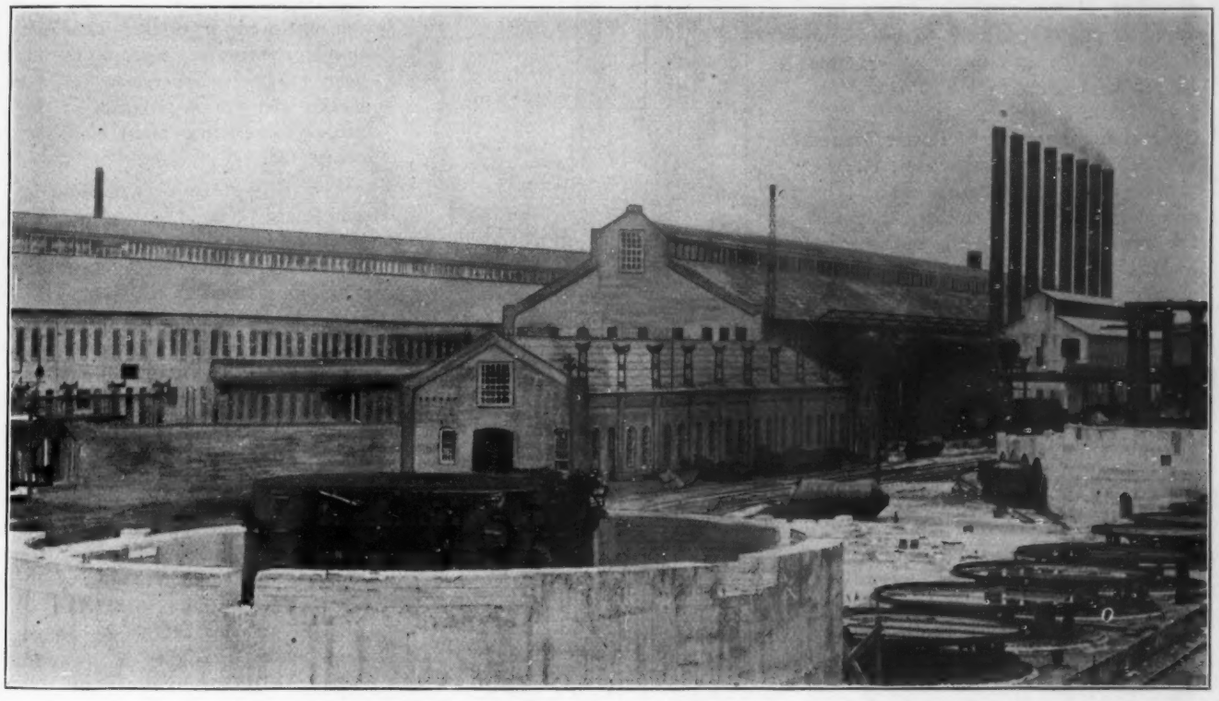


FIG. 1—GENERAL VIEW LOOKING FROM THE BLAST FURNACES TOWARD THE POWER PLANTS.

In the foreground is the central pumping station. To the right and back of that is the blowing engine house for furnaces 9 to 12, and the boiler house for those furnaces in front of it. In the rear is the electric power station building.

The first article of this series appeared in THE IRON TRADE REVIEW on Jan. 7, 1909.—EDITOR.

per cent of the total. Allowing for radiation losses, we have, therefore, a stove efficiency of about 75 per cent with 870 B. T. U. available for heating per pound of gas per hour. Dividing 55,926,000 by 870, we have 64,280 as the weight of gas required per hour. Reduced to terms of volume, this equals 617,730 cubic feet per hour for four stoves. Assuming 123,000 cubic feet of gas per ton of pig iron, which for basic iron should be fairly accurate, there is available 2,306,250 cubic feet of gas per hour per furnace. Of this, $\frac{617{,}730}{2{,}206{,}250}$ or 26.77 per cent is required for the stoves. There remains about 73 per cent of the total gas produced for use under the boilers and in the gas engines. At present the feed water for the boilers is not heated and the gas required amounts to about 10 per cent of the total, leaving a balance of, approximately, 60 per cent for use in the gas engines. Of this 15 per cent goes to the blowing engine house.

General Arrangement of Power Plants.

The blowing engine houses, electric power station, boiler houses and pumping station are located between the blast furnaces and the open-hearth buildings. They are grouped in a line parallel with the furnaces, the center line of the blowing engine houses being 273 feet west of the center line of the blast furnaces. The position of the blowing plant and the generating station permits of the shortest possible length of gas and cold blast mains, and, at the same time, locates the power station centrally for the distribution of current through the mills.

The blowing units are placed with the tubs on the side of the building nearest the furnaces, while in the generating station the units are placed in the opposite direction, so that the generators are all on the mill side of the power station. The gas mains are carried from the primary washers into the boiler houses, where, from a dust catcher located midway, the main conducting the gas for the blowing engine house and generating station is taken off to the secondary washers. The gas main for the gasometer into which the washed gas is delivered, is then carried to the west side of the blowing plant, along which it is hung. From the south end of the building a crossover branch is taken off to the generating station, a distance of 54 feet 10 inches from wall to wall. A gate valve is placed in the crossover main. The gas main is a pipe 8 feet diameter into the boiler house and 7 feet diameter from the boiler house to the gas washers. The delivery mains to the gas engines are 7 feet 6 inches diameter. The cold blast mains from the blowing engine house are 42 inches inside diameter, and have an average length from blowing tubs to the top of the stoves of 458 feet. The hot blast main from the stoves to the bustle pipe is 55 inches inside diameter, and has an average length of 111 feet.

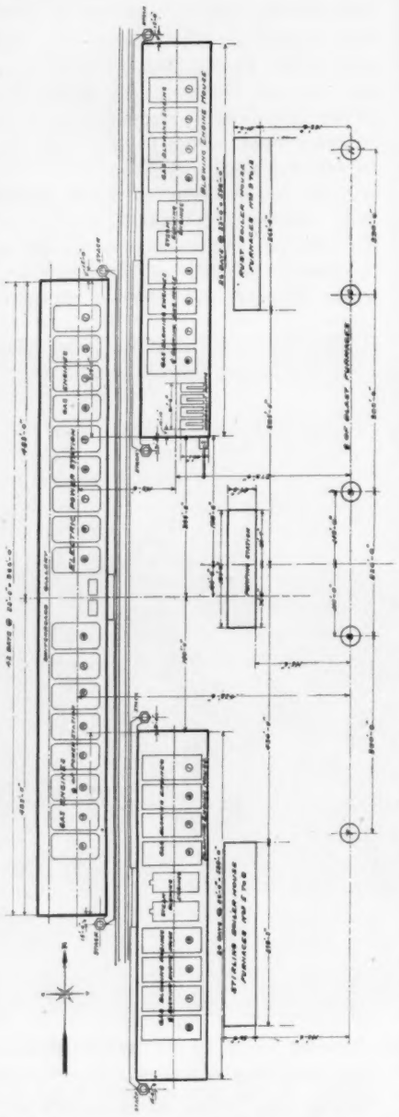


FIG. 2—LAYOUT OF THE ELECTRIC POWER STATION, BLOWING ENGINE HOUSES, BOILER HOUSES AND PUMPING STATION WITH RELATION TO THE BLAST FURNACES.

This location permits of distribution of power from a central point, and, at the same time, brings the blowing engine houses near to the furnaces.

Blowing Equipment.

The blowing equipment for the eight furnaces under construction is contained in two buildings, each one housing eight 2,500-horsepower twin-tandem gas-engine-driven blowing tubs of the Slick type, and two steam-driven, horizontal, cross-compound blowers. The building in which are the engines for furnaces Nos. 5 to 8 is 528 feet long, but the one in which are the blowers for furnaces Nos. 9 to 12 contains besides the blowing engines space for four hydraulic pumps, and is 70 feet longer, or 598 feet over all. Both buildings are 104 feet wide. The buildings are similar and of very substantial construction. The concrete foundations consist of a massive concrete slab 5 feet thick and of the same plan dimensions as the building, upon which are erected the individual piers for each engine. The superstructure is a heavy steel skeleton enclosed in brick. The installation for furnaces Nos. 9 to 12 has been ready for operation for several weeks, and the installation of the engines in the other plant is about half completed.

The two steam-driven blowing engines are located centrally in each blowing engine house, with four gas-engine-driven blowers on either side. The steam blowers are designed with the air cylinders in tandem with the steam cylinders and connected to them by heavy cast steel tie pieces and rigid box section sole plates, extending from the rear end of the bed plates under all cylinders and piston rod supports. The steam cylinders are 44 and 84 inches diameter. The air cylinders are 90 inches diameter and the stroke is 72 inches. Under average blowing conditions, running at 40 revolutions per minute with steam at 150 pounds and a vacuum of 26 inches, each blowing engine is designed to deliver 42,000 cubic feet of free air per minute, against a normal air pressure of 18 pounds.

The steam cylinders are fitted with Corliss valve gear and the air cylinders are equipped with a positive air valve gear. The air inlet valves are enclosed and arranged for connection with dry air mains through the box section sole plates. They can also be operated on air directly from the engine room. The engines have fly wheels weighing 50 tons each, and the total weight of each machine is about 500 tons. These steam-driven blowing units furnished all of the blast during the first days of operating the blast furnaces, but will, when

FIG. 3—A NEARBY VIEW OF THE MASSIVE CONCRETE FOUNDATIONS USED FOR THE ELECTRIC POWER STATION.

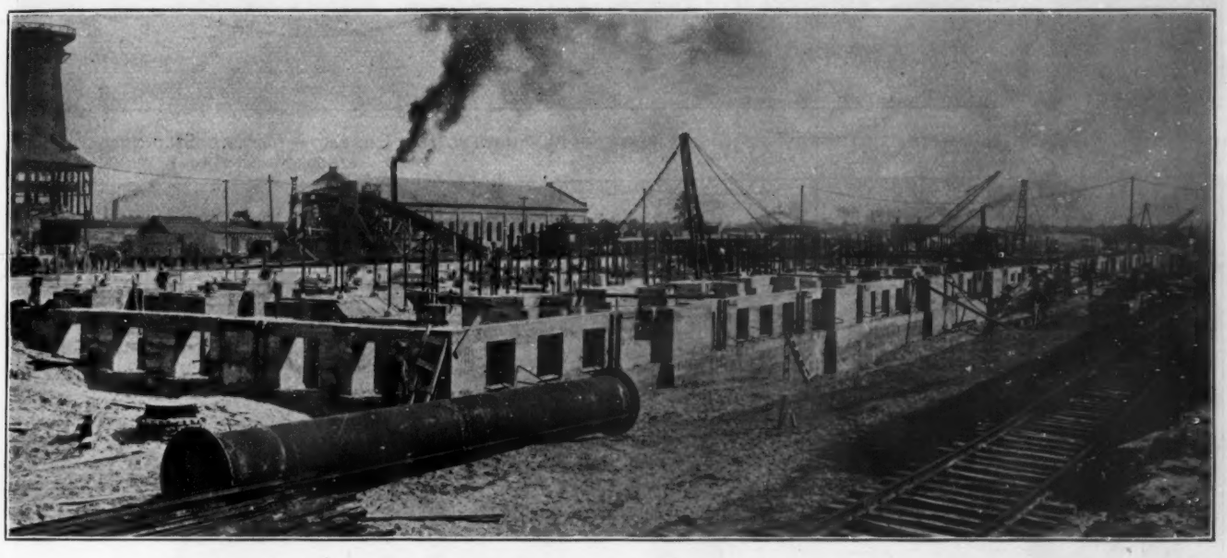


FIG. 4—CONCRETE FOUNDATIONS FOR THE ELECTRIC POWER STATION.

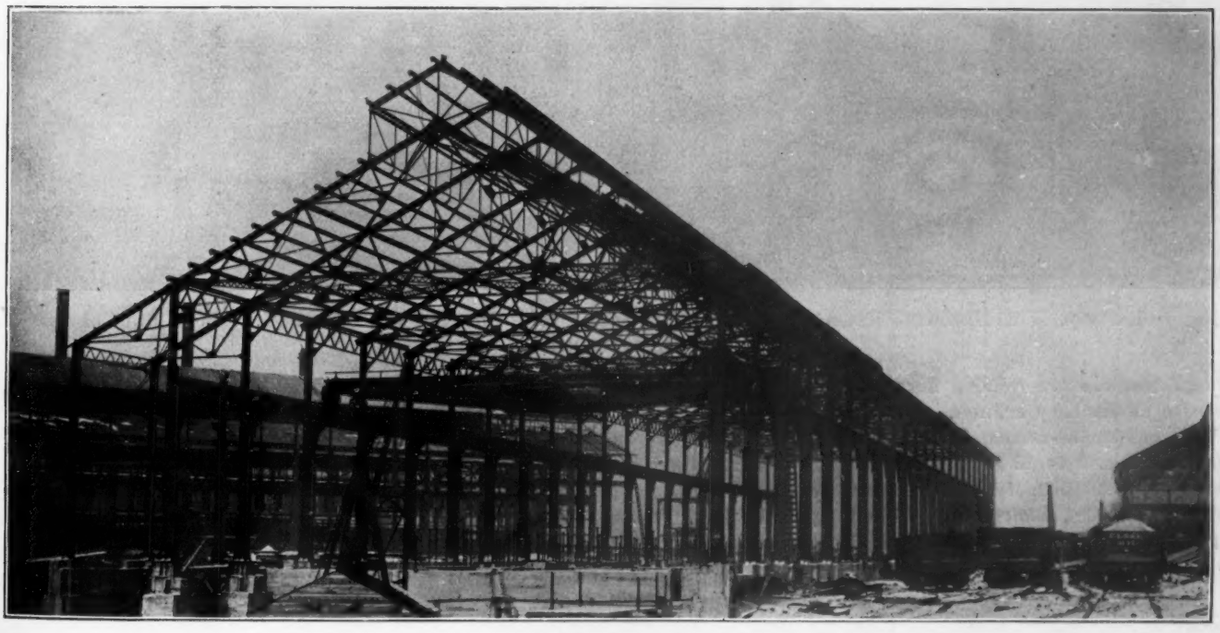


FIG. 5—CHARACTER OF THE STRUCTURAL FRAMEWORK OF THE ELECTRIC POWER STATION.

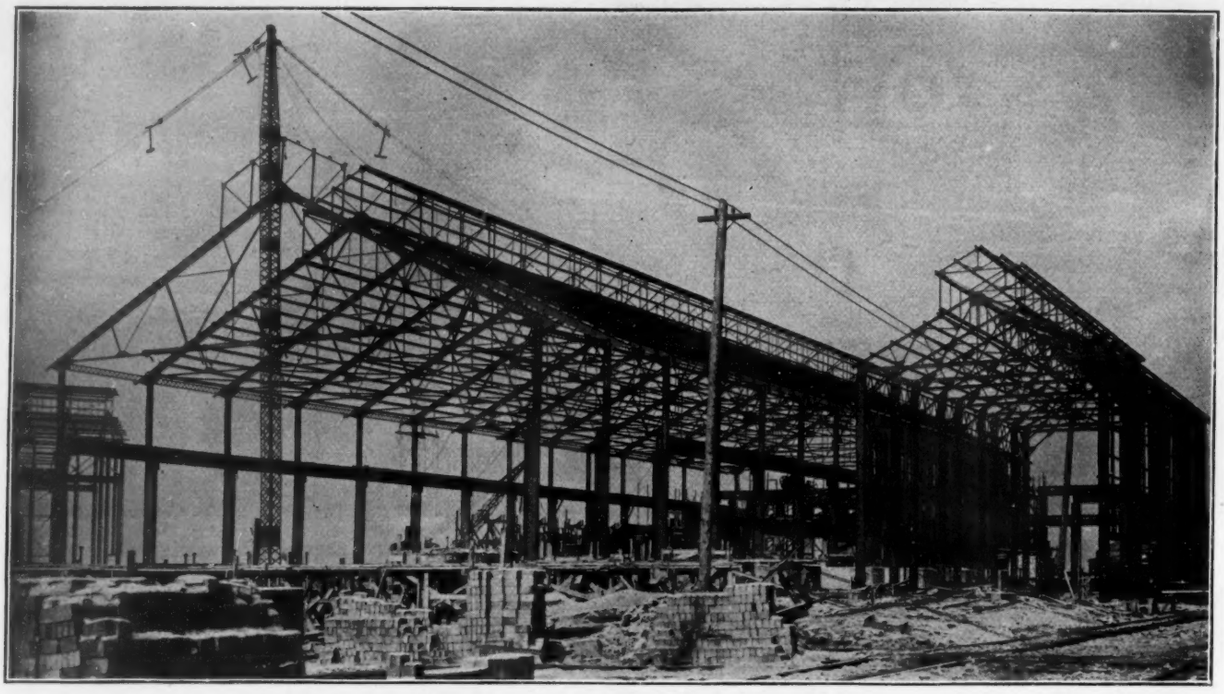


FIG. 6—BLOWING ENGINE HOUSE AND BOILER HOUSE UNDER CONSTRUCTION, SHOWING THE CHARACTER OF THE STRUCTURAL WORK.

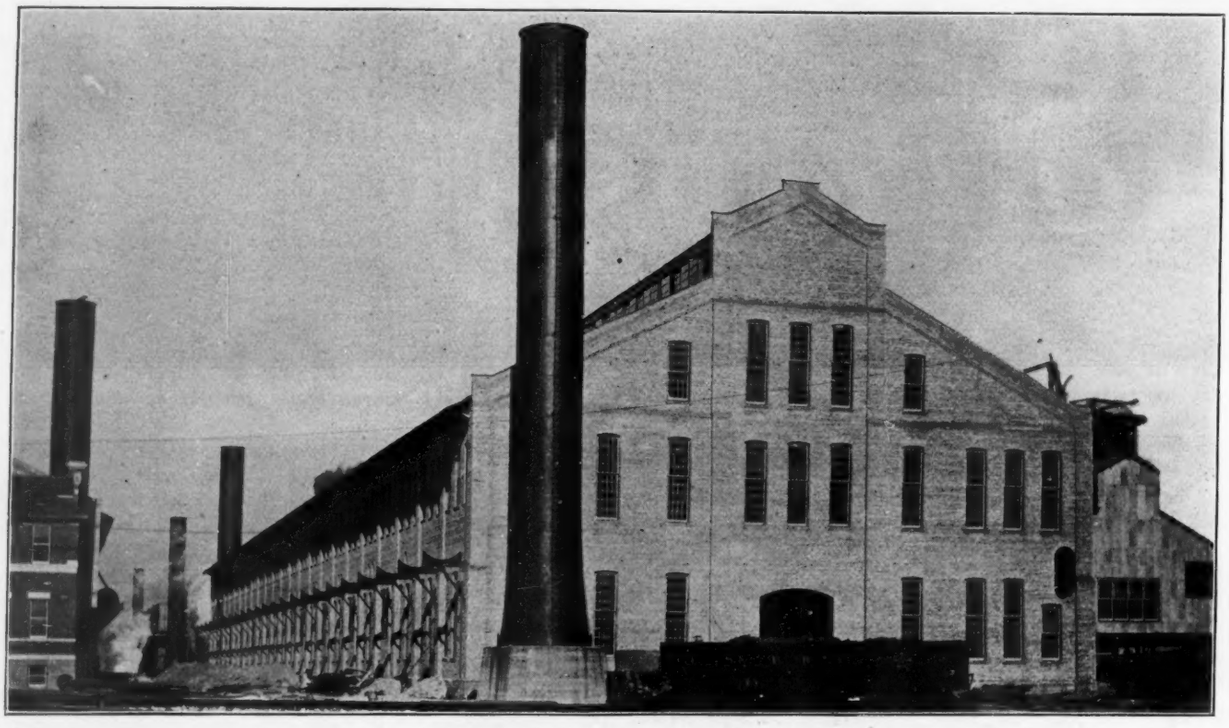


FIG. 7—EXTERIOR OF THE BLOWING ENGINE HOUSES FOR FURNACES 5 TO 8, SHOWING THE CHIMNEYS AT BOTH ENDS OF THE MUFFLER TUNNEL.

Stacks are 92 feet high. The brackets on the side of the building carry the gas main.

the gas engines are running normally, be used as auxiliary engines.

The gas-engine-driven blowers for furnaces Nos. 9 to 12 have gas cylinders 42 inches diameter and blowing tubs 72 inches diameter by 54-inch stroke. They operate normally at 75 revolutions per minute, developing 2,500 horsepower and delivering 33,000 cubic feet of air per minute at 18 pounds per square inch pressure. Under forced load they are capable of developing 3,500 horsepower and will deliver 28,000 cubic feet of air at a pressure of 30 pounds per square inch. Each set of four engines serves two of the group of four furnaces, and the cold blast mains for each stack extend along half the length

of the building. Each blowing tub has a separate connection to the cold blast main of each furnace, so that the engines may be operated interchangeably to supply air for either furnace. There is thus available an aggregate of 87,000 cubic feet of air for each furnace. The muffler arrangement for the gas engines is unique and is similar for both the blowing engines and the engines in the generating station. A tunnel, approximately 12 feet x 9 feet, has been built immediately outside of the building and along its entire length, terminating at each end in a steel stack 9 feet diameter and 92 feet high. Into this tunnel the gas exhaust pipes from the engines discharge. The exhaust pipes have a water seal, so that when any one engine is down the exhaust gases from the remainder of the plant are prevented from backing up into the cylinders. The tunnel also carries off the drainage water. Air for the gas mixture is obtained through a shuttered passage in the side wall of the engine house.

The more rapid reciprocation demanded in gas engine operation requires that the blowing tubs be capable of filling with air very rapidly. The advantage of the Slick tubs for high speed operation are well known; and the manner in which the air ports are opened and closed by the partial rotation of the cylinder has been elsewhere described. This type of tub is used throughout. The gas engines[2] in the blowing engine house for furnaces Nos. 9 to 12 are of different type from those in the other plant. With the exception of the manner of governing, the differences between the Westinghouse and Allis-Chalmers engines, which are the two types installed at this plant, are matters of detailed design. The Westinghouse engine is governed by throttling, while the other uses the stratification method. The cylinders of the Allis-Chalmers Co. engines are also 2 inches larger in diameter, or 44 inches.

In starting, the gas engines are turned over with air at 200 pounds pressure taken from a 30-inch pressure main, extending under the entire length of the building. A new system of ignition, devised by the engineers of the steel company, has been installed and consists of two 5-kilowatt motor-generator sets, so arranged as to give independent control of each engine.

The blowing engine houses are each

[2]A complete description of both types of engines may be found in the proceedings of the National Electric Lamp Association, May, 1908.

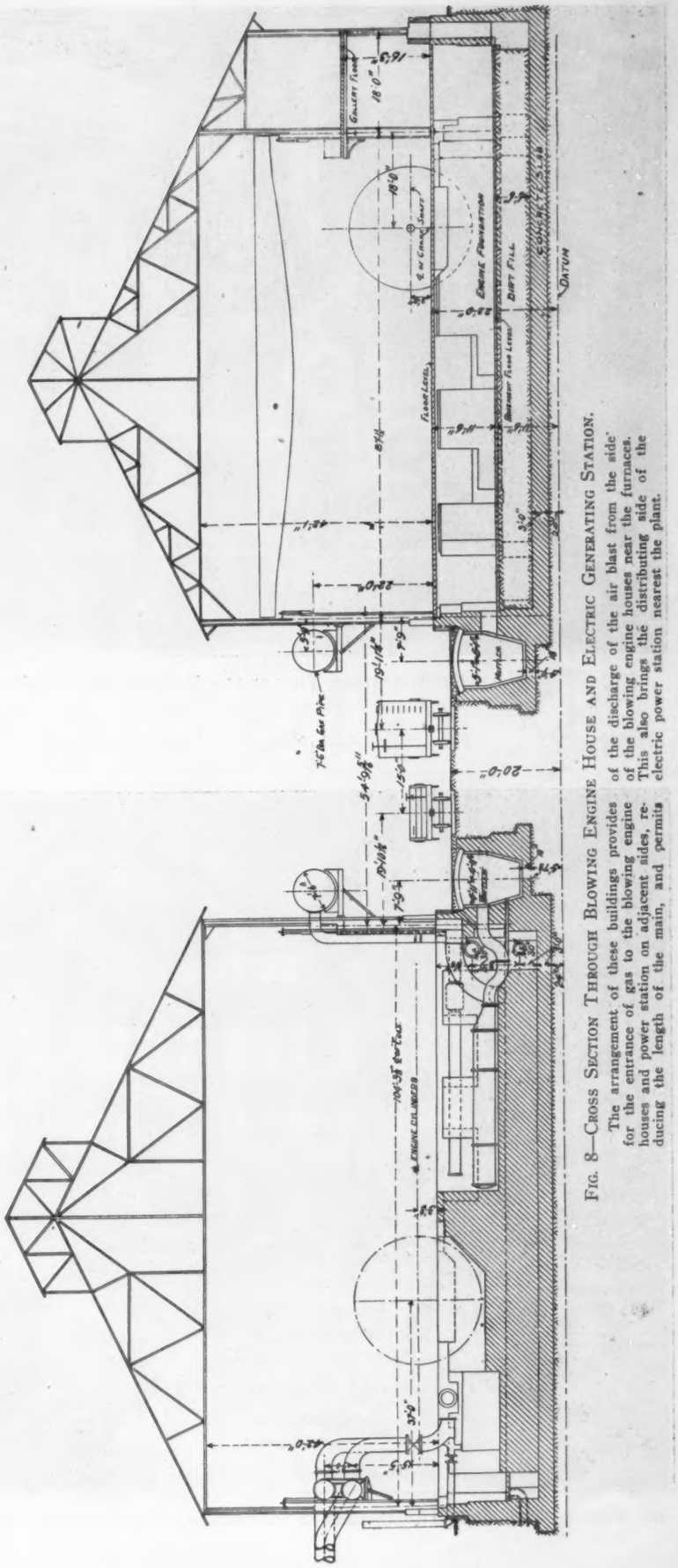


FIG. 8—CROSS SECTION THROUGH BLOWING ENGINE HOUSE AND ELECTRIC GENERATING STATION.

The arrangement of these buildings provides for the entrance of gas to the blowing engine houses and power station on adjacent sides, reducing the length of the main, and permits of the discharge of the air blast from the side of the blowing engine houses near the furnaces. This also brings the distributing side of the electric power station nearest the plant.

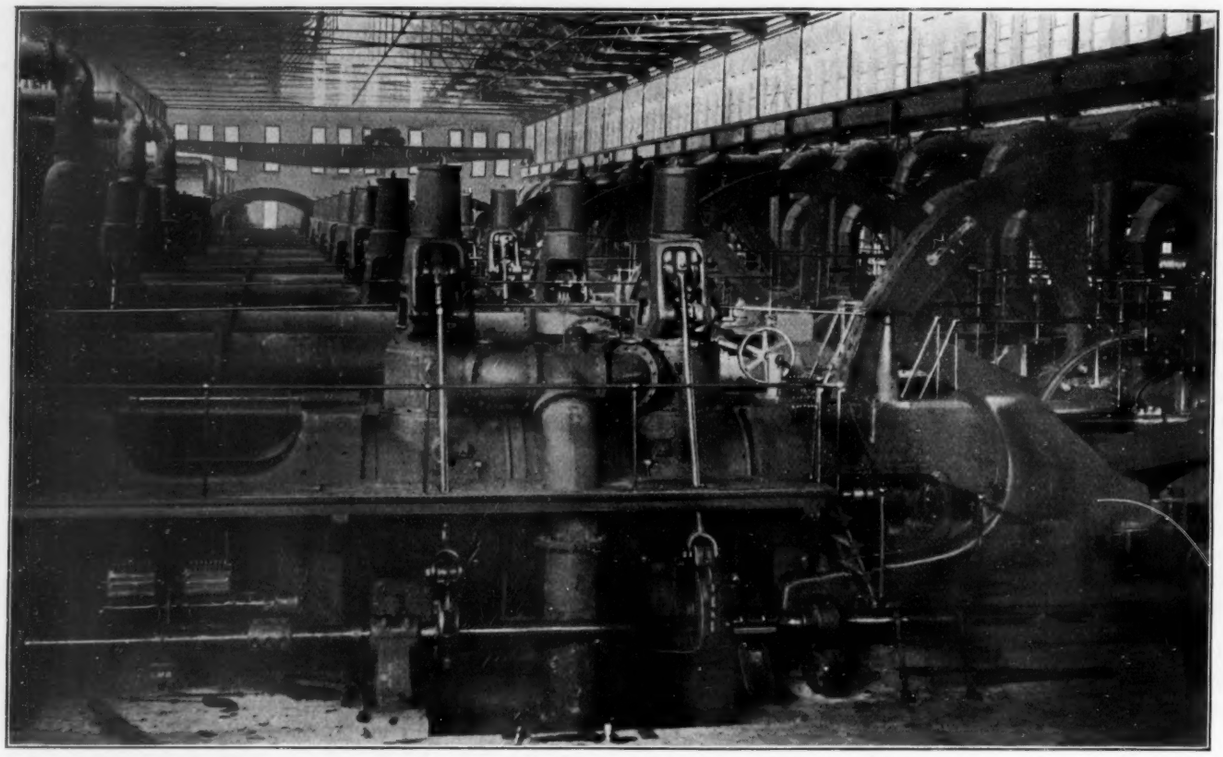


FIG. 9—INTERIOR VIEW OF THE BLOWING ENGINE HOUSES FOR FURNACES 9 TO 12.

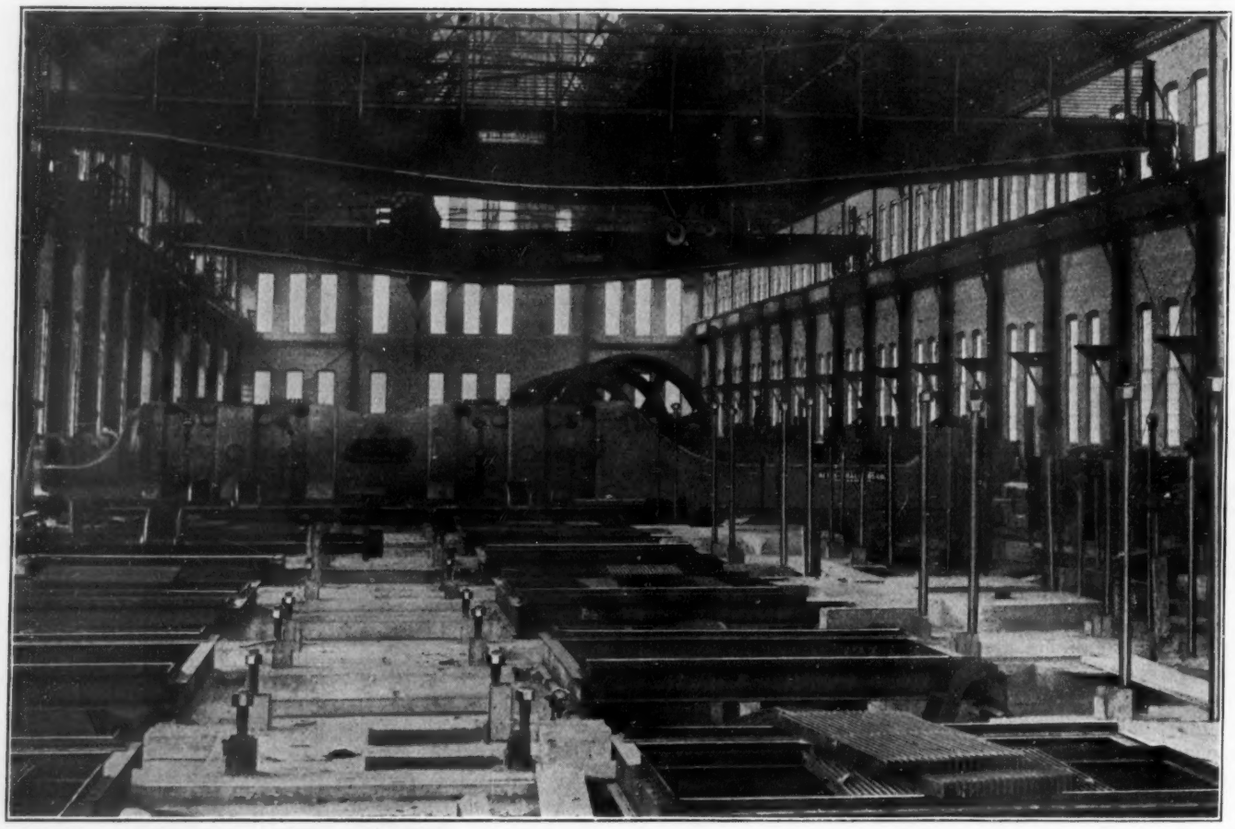


FIG. 10—INTERIOR OF THE BLOWING ENGINE HOUSES FOR FURNACES 5 TO 8.

spanned by two 50-ton traveling cranes with 15-ton auxiliaries, operating over the entire length of the building. At one end, the stub end of a railroad spur enters far enough so that material may be unloaded from cars by the cranes. The hydraulic pumping plant will ultimately include four horizontal crank-and-flywheel, cross-compound pumping engines, of which three have been installed. They operate condensing and have a capacity of 1,900 gallons per minute, delivering water at a pressure of 500 pounds. The water is brought from the harbor slip in a 20-inch pipe and is delivered to the various parts of the plant through a high pressure system laid in underground tunnels.

Electric Power Station.

In the electric power station building are combined stations No. 2 and No. 3, intended to supply power to all of the plants associated with eight furnaces. The building in its construction is similar to the blowing engine houses, and is 966 feet long and 105 feet wide. In this width is included a gallery bay 18 feet wide, extending the length of the building, to provide for the bench board and other controlling apparatus, at an elevation of 16 feet, 3 inches above the main floor. As in the blowing engine house, the foundations are extremely heavy. A monolithic slab, 5 feet thick, bottomed at a depth of 1½ feet below the water level, carries the separate foundations for the engines. These are concrete piers rising 18 feet above the base, and are, approximately, 40 x 80 feet over all.

The arches forming the roof of the power station have a clear span of 85 feet, providing headroom, at the dome, of 73 feet above floor level. The station is served by two 51-ton cranes. Roofing is very heavy galvanized corrugated steel. The interior walls for a distance of 10 feet are of white enamel brick, but above that point the surfacing is in red pressed brick. The exterior consists of red building brick. In order to pass from one side to another of this building, a subway has been built under the floor at its central point, thus enabling the workmen to avoid a long detour, and, at the same time, keep out of the power house.

The generators in the power house have a rated aggregate capacity of 34,000 kilowatts in alternating current, and 4,000 kilowatts in direct current. This power is obtained from 15 alternating current 2,000-kilowatt and two direct current 2,000-kilowatt 250-volt generators driven by twin-tandem gas engine units, and two steam turbo-generator sets driving 2,000-kilowatt alternating-current four-pole generators. The auxiliary machinery consists of three 500-kilowatt synchronous motor-generator exciter sets for the gas-engine-driven generators. Two of these are sufficient for operation, leaving a third for emergency. These motor-generator sets are made up of eight-pole 6,600-volt synchronous motors and 12-pole, 250-volt generators, operating at 375 revolutions per minute. It is also provided that the exciter bus may be connected to the 250-volt power bus. The exciter set for the turbo-generators is a motor-generator set made up of a six-pole, 440-volt induction motor and a 70-kilowatt, 125-volt generator.

The turbo-generator sets are centrally located in the building. They are operated condensing, with steam at 150 pounds and run at 750 revolutions per minute. With the exception of the two 8 x 24 x 24-inch dry vacuum pumps, all of the auxiliary apparatus is below the main floor, including the 9,000-square-foot, surface condenser volute hot well pumps, with their driving motors, oil pumps and filters. The exhaust pipe discharges into the muffler tunnel. The gas engines driving the generators are rated at 4,000 horsepower and operate at 83 1/3 revolutions per minute. This installation of gas engines, both with respect to the individual capacity of each engine and the aggregate power available, is the largest single gas engine plant in the world.

A Noteworthy Transmission Line.

The alternating current generated is three-phase at 6,600 volts and 25 cycles, and all of the circuits are ungrounded delta connected. There is also installed a 22,000-volt line from the South Chicago works of the Illinois Steel Co., connecting Gary with South Chicago, 18 miles away. The transformers for this line at the Gary station are three 3,000-kilowatt, 22,000/6,600-volt water and oil-cooled transformers. During the construction of the power station the mills were dependent upon power obtained from South Chicago and from the turbo-generator sets. Frequently, the turbo-generators were operated in parallel with the South Chicago line, and this may be made a permanent arrangement for the interchange of power between the two plants. While it has not been found necessary, thus far, regular operation in parallel may require that an alternating-current booster, automatically controlled, be put in the line.

To provide for the peak loads, there are installed two storage bat-

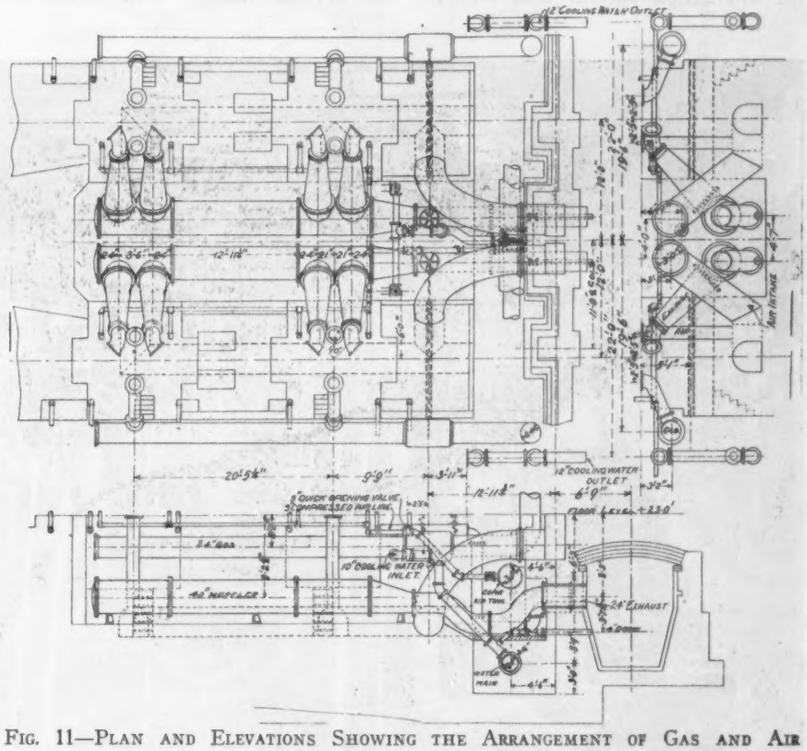


FIG. 11—PLAN AND ELEVATIONS SHOWING THE ARRANGEMENT OF GAS AND AIR PIPING FOR THE GAS-DRIVEN BLOWING ENGINES.

teries, each of 4,000 ampere-hours capacity. The storage batteries are connected in parallel with both the alternating current and direct current systems. The control for the regulation of the direct current system is through a carbon regulator, which controls the fields of two motor-driven boosters, which may be operated singly or in parallel. The regulation of the alternating current system is effected through two 18-pole 2,000-kilowatt, 200/300-volt, split pole rotary converters. The regulation of the rotaries is in turn effected by means of a special exciter, so that the alternating current load will remain practically constant regardless of fluctuations or power factor changes. The transformers for the split pole rotaries are six 800-kilowatt, 6,600-volt oil and water-cooled.

While the distance to be covered requires that alternating current be used wherever possible and that motor-generator sets be installed where direct current is to be used at some distance from the power station, direct current is used for all cranes, inside arc lamps, ore bridges, skip hoists, ore unloaders, charging machines and for many uses in the various mills.

The Electric Control System.

All of the electrical apparatus in the station is operated from a remote control board located in the gallery of the power house. The station is divided into two parts, so far as the switchboard is concerned. This control board is of the bench board type, and is divided into three sections. Section 1 consists of seven panels for the control of seven alternating-current generators and exciter sets. Section 2 consists of 11 panels for the control of nine direct-current feeders, nine alternating-current feeders and the 22,000-volt line from South Chicago. This section also controls the tie line for tieing together the present stations with future installations, when completed. Section No. 3 consists of 12 panels, from which are controlled the two direct-current generators, the storage battery, the split pole rotaries, the boosters and rotary exciter set with the carbon regulator. The alternating-current circuit has the double bus system, and there are two oil switches for each alternating-current generator or feeder, to connect to either of the two systems. To prevent these oil switches from being closed at the same time, their control switches are interlocked by a mechanical interlocking device. The control switches for the alternating-current generator, the rotary converter and the synchronous motor, are designed to operate in conjunction with an automatic synchronizer. The switchboards for the direct-current generators are located as near as possible to the machine using the current, so that the distance between the circuit breakers and the machines is reduced to a minimum.

The bench board is of a very substantial construction, with an angle iron framework. The sides and rear have removable sheet steel sections, so that the interior of the board is easily accessible for repairs, testing and inspection. A special feature of thes boards are the test panels. All small wiring from the instruments and the various transformers and switches in the station terminate on these panels, where each individual circuit can be tested out, without disturbing the system. On the top panels of the bench board are mounted all of the necessary instruments. The control switches for operating the oil switches, circuit breakers, field switches, rheostats and governors are mounted on the bench panels also. These

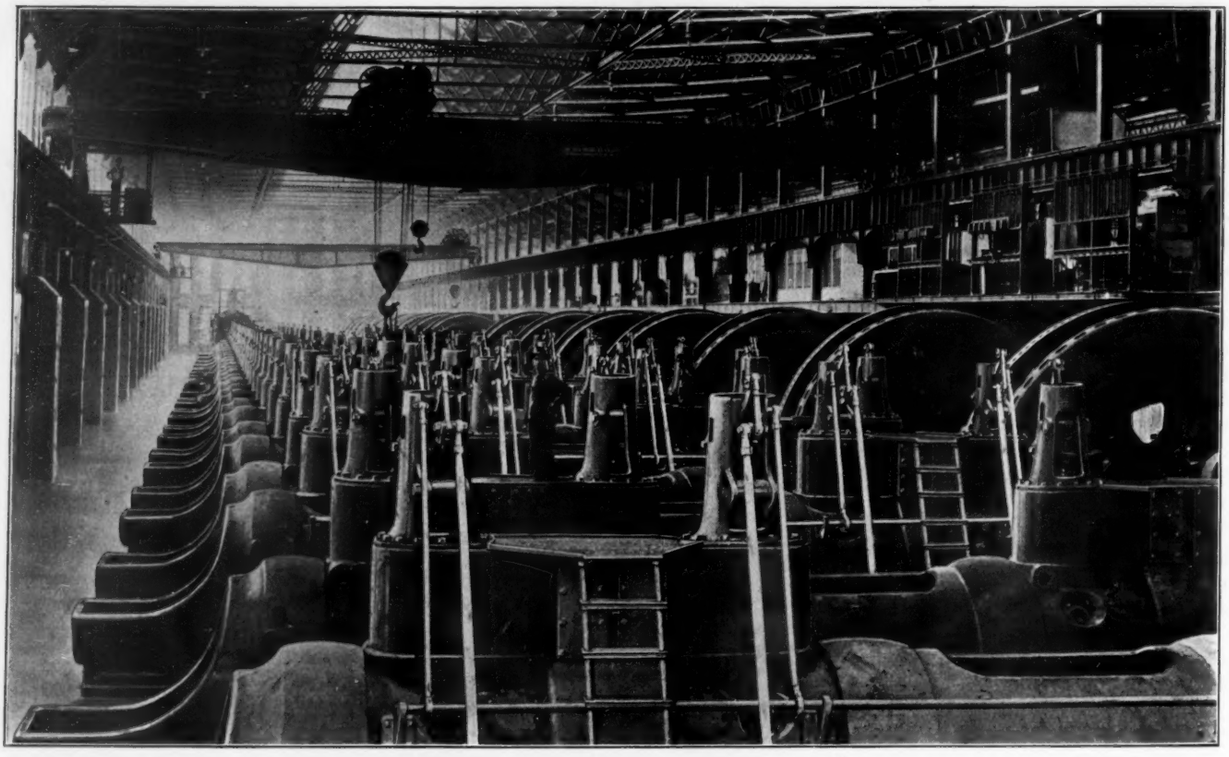


FIG. 12—INTERIOR OF THE ELECTRIC GENERATING STATION.

This is the largest installation of gas engines driving electric generators in the world. There are 17 twin-tandem units, each driving a 2,000-kilowatt generator. The aggregate horsepower of the gas engines enclosed in this building is 68,000.

control switches are provided with green and red indicating lamps to designate the span or closed position of the switches which they control.

The alternating-current bus bars and oil switches are enclosed in compact white enameled brick compartments. The bus bar structure is of the double deck construction, with the generator switches located on the engine room floor and the feeder switches directly above in the gallery. The oil switches are of the solenoid-operated type, the generator switches being provided with plain reverse current relays and the feeder switches with inverse time limit relays. The direct-current circuit breakers are all of the motor-operated, carbon break type located near their respective machines. All of the direct-current switchboards are of double construction style, with positive apparatus mounted on one side and negative apparatus on the other, to avoid any possibility of short circuit when repairs are made. The direct-current bus bars are ¼ x 5-inch solid copper bars from the generator terminals to the distribution towers outside of the building. The alternating-current generator leads consist of three-phase, 350,000 circular mils, paper insulated, lead covered cables from the generator terminals to the bus structures. These cables are carried under the main floor on a concrete cable bench, each cable lying in a separate groove.

The Transmission System.

The circuits leave the power house on three distribution towers, two of which are alternating current and one direct current. The direct current distribution consists of weather proof cables of 1,000,000 circular mils, some 500,000 circular mils, some 0000 and some 0. These are the only sizes used for direct-current distribution. The alternating current distribution is either 0 or 0000, seven strand, hard-drawn, bare cable. For the heavy circuits the cables are multiples of 0000 per phase. There is, approximately, 300 tons of line copper, exclusive of wire inside of the building, suspended on the distributing towers of the Gary transmission line. This tremendous weight of copper explains in itself the necessity for using 6,600 volts.

Each pole line practically consists of a double line, one-half of each circuit being carried on each one-half of the pole, with a complete arrangement, in case of trouble on the line, so that one-half of all the circuits can be disconnected. Repairs can then be made on dead circuits, and, at the same time, the mills may be kept in operation with only a slightly increased drop in voltage. The alternating current circuits are run in delta, 20¼-inch spacing. There are no holes bored in the cross arms of the towers, the arms being clipped to the poles and malleable iron pins being clipped to the cross arms for the insulators. The insulation of the entire line is built for 17,000 volts working pressure. Throughout the entire system a color scheme is provided, giving to each phase a distinctive color, so that tracing is comparatively simple. The poles, which are of special construction to meet the entirely new conditions at this plant, were designed by the electrical engineer of the Indiana Steel Co. The protection of the circuits is very complete. Each outgoing circuit is protected by lightning arresters, those for the alternating current feeder being of the graded shunt type. Connected to each set of alternating-current bus bars, there are also installed two electrolytic lightning arresters. Running parallel with the distributing wires and above all of them are ground wires and each pole is thoroughly grounded.

Boiler Plant.

For the eight blast furnaces, 12,800 horsepower of boiler capacity is provided. The plant is arranged in two boiler houses, each containing half of the total power. The boilers are arranged in eight settings of two boilers each. For furnaces Nos. 9 to 12, a battery of Rust vertical tube boilers is installed, and for furnaces Nos. 5 to 8, Stirling boilers. The mountings, piping and arrangement of both batteries are standard. The boilers rest on heavy concrete foundations and the boiler houses have a steel framework enclosed in corrugated steel sheeting and are similar, except for size. The vertical boilers required a building 41 feet wide, 262 feet long and 40 feet high from the ground level to the bottom of the roof trusses, while the other building is 50 feet wide, 279 feet, 3 inches long and only 28 feet from the floor to the bottom of the roof trusses. This difference in height required a different arrangement of the gas mains. In the higher building the gas main for the primary washers

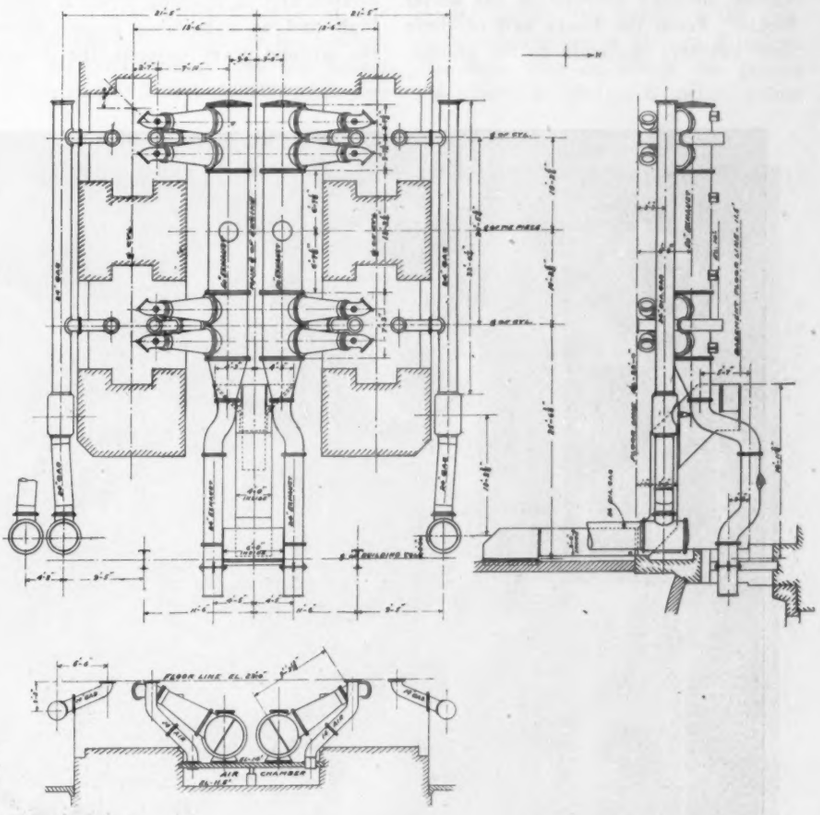


FIG. 13—GENERAL ARRANGEMENT OF THE GAS AND AIR PIPING FOR THE GAS ENGINE UNITS IN THE ELECTRIC POWER STATION.

The exhaust pipes have a water seal, as shown, and discharge from the blowing house into a muffler tunnel, which extends the length of the building.

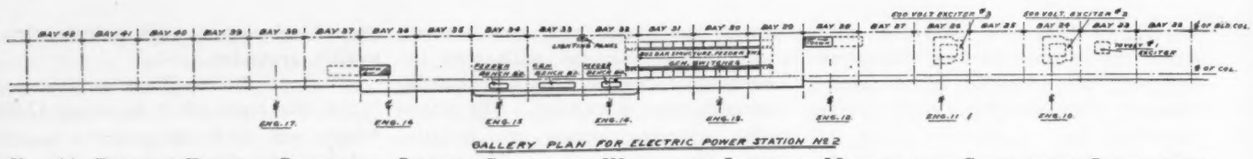


FIG. 14—PLAN OF ELECTRIC GENERATING STATION GALLERY IN WHICH ARE INSTALLED MOST OF THE CONTROLLING SWITCHBOARDS AND APPARATUS.

This gallery extends the entire length of the building, is 16 feet 3 inches above the ground floor and 18 feet wide. The entire system is remote control.

enters the building and is hung from the roof trusses. In the other building the gas main is carried on the roof. In both instances the entering main terminates in a cylindrical dust catcher located midway in the boiler house. From the lower half of these dust catchers the main to the secondary washers and a branch connecting the two boiler houses is taken. These distributing mains parallel the boilers and the leads to the boilers are taken off opposite each boiler. Dust legs are located every 62 feet on the gas mains within the boiler houses.

The boilers are arranged to be fired with both coal and gas. A coal unloading track parallels the boiler houses, and an opening 3 feet 6 inches high and at a suitable height above the ground level extends the length of the building and provides for unloading coal on to the coal storage space in front of the boilers. As it is intended to use the boilers only as an auxiliary plant no mechanical devices for stoking and handling ashes are installed.

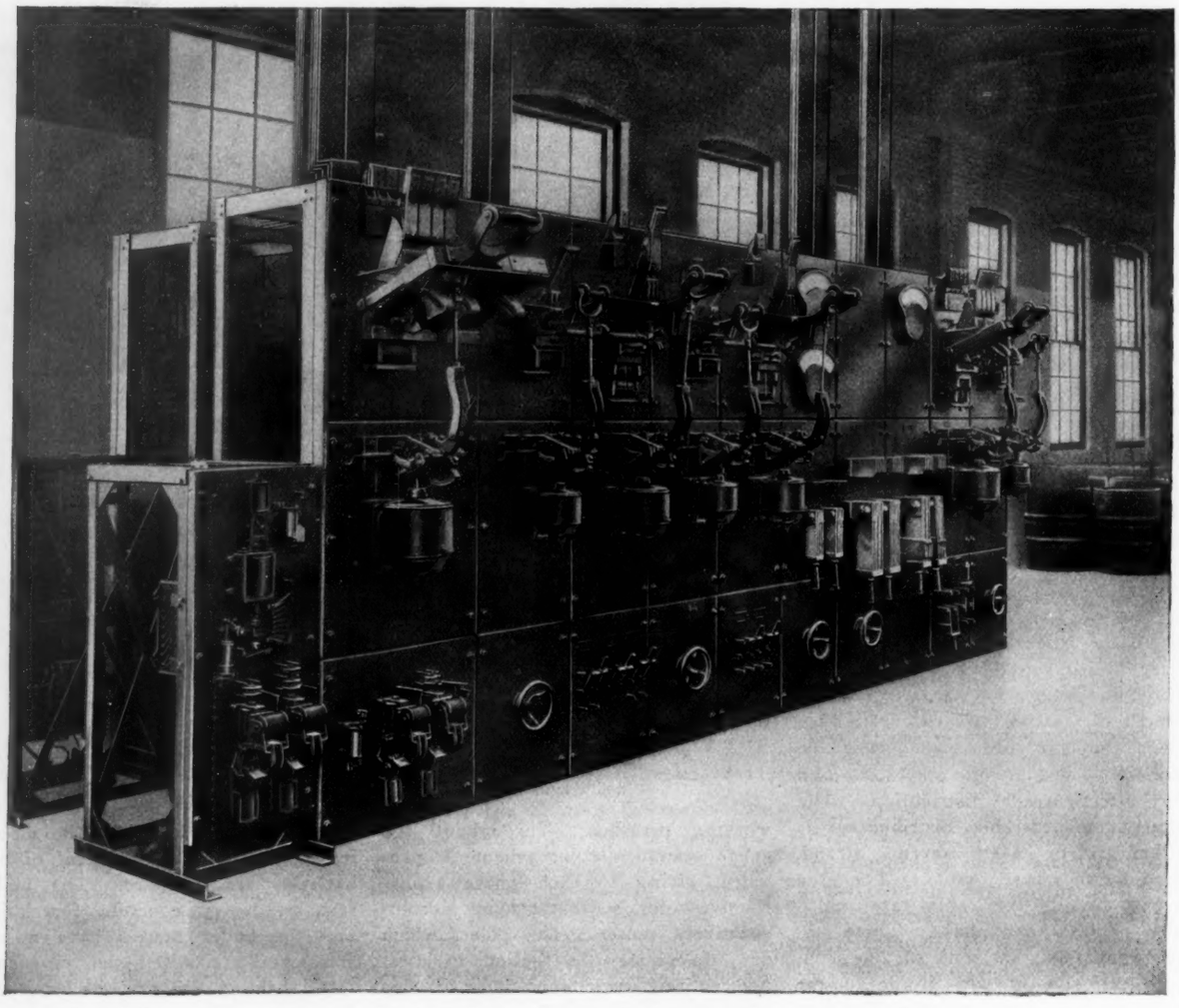


FIG. 15—ONE OF THE TYPICAL SWITCHBOARDS.

This one is the circuit breaker switchboard for the storage battery, rotary converters and booster.

Central Pumping Plant.

The service water for the Gary plant is obtained from the harbor slip at a point 3,000 feet in from the lake end of the piers through two parallel reinforced concrete tunnels. The center lines of the tunnels are 11 feet below datum and 7 feet apart, and the tunnels are 10 feet inside diameter. From the face of the concrete slip wall in which the entrance to the tunnel is built with added reinforcing, to the well in the pump house, is 761 feet 6 inches. The nature of the soil and depth below water level made the building of the mouth of the tunnel a matter of some

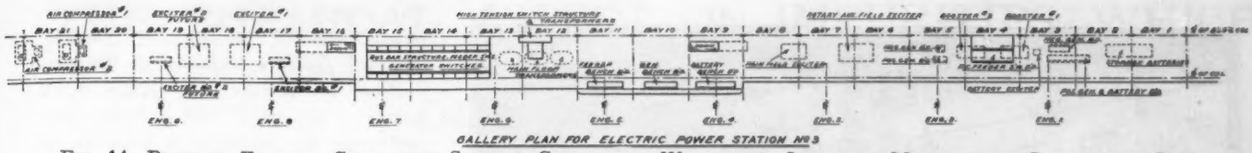


FIG. 14—PLAN OF ELECTRIC GENERATING STATION GALLERY IN WHICH ARE INSTALLED MOST OF THE CONTROLLING SWITCHBOARDS AND APPARATUS.

This gallery extends the entire length of the building, is 16 feet 3 inches above the ground floor and 18 feet wide. The entire system is remote control.

difficulty. The working area was enclosed in sheet piling in order to excavate, build the forms and pour the concrete. The tunnel was built from both ends and a joint made between the terminals. The entrance to the tunnel is protected by steel bars 6 x 1½ inches by 17 feet 6 inches long spaced 10 inches apart across the tunnel opening and set on edge on the concrete in a vertical position.

The heavy concrete mouth extends back 14 feet 9 inches. The balance of the concrete for the tunnel proper is 2 feet thick reinforced longitudinally by 12 1-inch square bars spaced equally around a 12-foot circle and tied to circular ¾-inch square bars spaced 2 feet apart on top of the tunnel and 4 feet apart on the bottom. At the pump house end the tunnel terminates at a well 17 feet wide and 126 feet 8 inches long with a capacity for 257,500 gallons. Vertical screens are set longitudinally in the concrete bottom of the well and are bolted to the floor beams above to protect the pump suctions.

The pump station substructure is a massive concrete stepdown from a width of 9 feet at 12 inches below datum, where it is bottomed 2 feet 9 inches at the top, 6 inches above ground level. The depth of the concrete substructure is 21 feet, 6 inches. The floor line on which the pumps are placed is 18 feet 6 inches below the top, or 2 feet above datum. The inside dimensions of the substructure are 43 feet wide by 145 feet long. The pumps are anchored on concrete blocks 5 feet 9 inches high, 3 inches wide and 7 feet 6 inches long. There are installed six motor-driven turbine pumps, each having a capacity of 25,000,000 gallons every 24 hours.

FIG. 16—END VIEW OF THE BENCH BOARD INSTALLED IN THE GALLERY OF THE ELECTRIC GENERATING STATION.

From this board the operation of the entire plant may be registered.

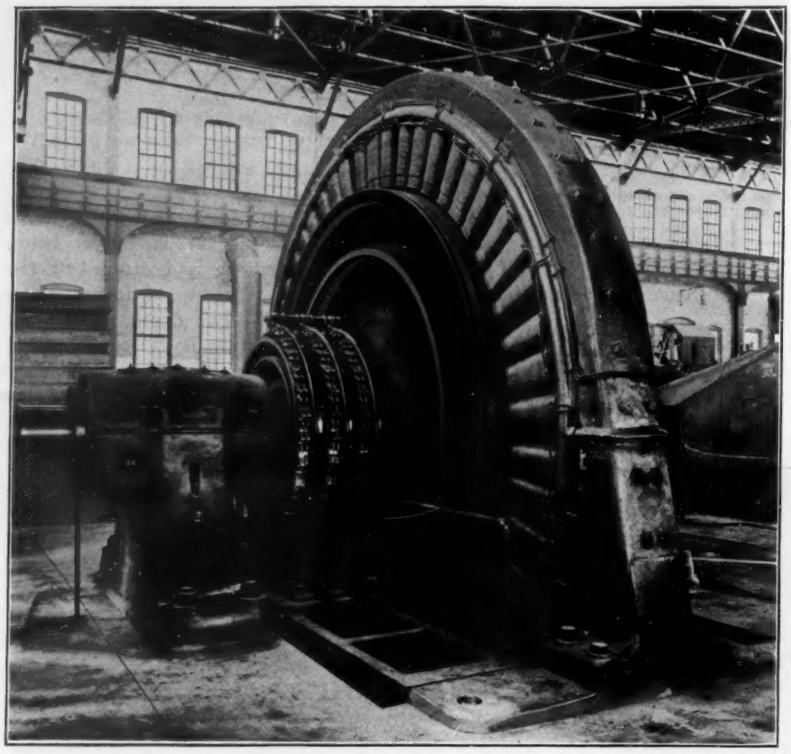


FIG. 17—SPLIT POLE ROTARY INSTALLED IN THE ELECTRIC GENERATING STATION AS A TIE BETWEEN THE STORAGE BATTERIES AND THE ALTERNATING CURRENT BUS BAR.

This acts as a condenser on the line.

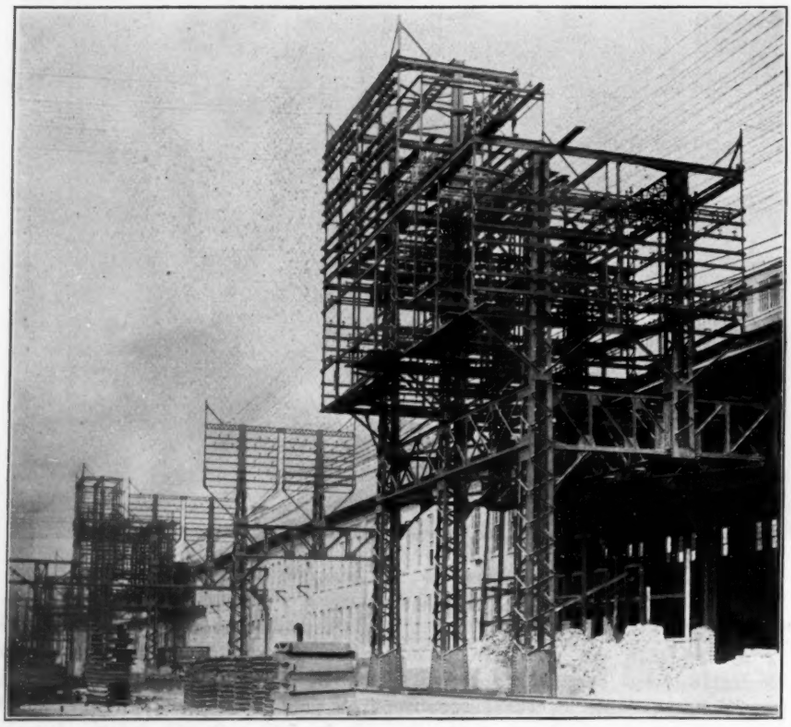


FIG. 18—DISTRIBUTING SIDE OF THE ELECTRIC GENERATING STATION, SHOWING THE DISTRIBUTION TOWERS.

These are the heaviest distributing towers ever built and carry approximately 300 tons of copper wire.

The pumps are driven by 600-horsepower, 440-volt, three-phase, 25-cycle, induction motors, running at 480 revolutions per minute. The pumps work against a lift of 17 feet 2 inches and discharge the water at a pressure of 45 pounds per square inch. These pumps are placed 20 feet centers and discharge into a common header 42 inches diameter. In addition to the motor-driven pump, there is installed a steam turbine-driven turbine pump and two 14 x 25 x 13 x 24-inch horizontal, duplex tandem steam plunger pumps. The former has a capacity of 20,000,000 gallons every 24 hours, and the latter pumps a combined capacity of about 10,000,000 gallons, giving the entire pumping station a total capacity when in full operation of 180,000 gallons. The steam turbine pump set was installed to take care of the plant prior to the erection of sufficient motor-driven pump capacity, and is not intended to be used continuously. The superstructure for the pumping station is a steel framework building enclosed in brick. The height from the top of the foundations to the bottom of the roof trusses is 20 feet and the columns carry a 15-ton crane with a span of 44 feet. The controlling switchboard and apparatus for the plant are installed in a gallery at one end.

Reorganization Plan.—The committee of creditors of the South Baltimore Steel Car & Foundry Co., Baltimore, Md., has announced the outline of a plan for the reorganization of the company, which is now in receivers' hands. This provides for the formation of a new concern, to be known as the Baltimore Car & Foundry Co., with a capitalization of $1,500,000. Of this some $250,000 is to be held as working capital and the balance is to cancel claims of creditors, the stock to be accepted at par in full settlement. The plan also provides for the pooling of the stock for a certain period; it makes no provision for the existing common and preferred stock.

The American Bell & Foundry Co., Northville, Mich., at its annual meeting, elected the following officers: President, Frank S. Harman; vice president, Charles Filkins; secretary, William Phillips; treasurer, R. C. Yerkes; who, with the following, compose the board of directors: Charles Coldren, L. W. Simmons; F. S. Neal. Reports showed the company's affairs to be in good condition, and a dividend of 6 per cent was ordered paid.

THE CHEMICAL ASPECT OF IMPURITIES WHICH CAUSE SCALE AND CORROSION IN STEAM BOILERS[1]

By J. C. Wm. Greth.[2]

The impurities in water cause a waste in many processes, but the greatest waste occurs from scale and corrosion in steam boilers.

Many indirect attempts at water purification are made, such as the use of exhaust and live steam heaters as purifiers, condensing apparatus to obtain distilled water, mechanical devices inside and outside of the boiler, and also various chemicals compounded and sold under the general name of "boiler compounds." None of these devices or methods overcome the troubles produced by impure feed water, for the simple reason that instead of removing the cause they deal with the effect of the impurities. Even though boiler compounds may be correct chemically, the method of application is irrational, since instead of removing any of the impurities, more are added.

The chemist, as a result of his investigation, has shown the way in which to prevent scale and corrosion in boilers and also how to prevent losses in the industrial arts. His method is to remove from the water the objectionable salts which it contains by changing the soluble salts into insoluble precipitates, which can then be removed by sedimentation and filtration before the water is used.

We are dependent upon natural water supplies for the water converted into steam; these supplies are rarely, if ever, pure, for water in its descent to the earth as rain absorbs carbonic acid, some air and other impurities. The carbonic acid absorbed enables it to dissolve certain salts of lime and magnesia. Other substances will be dissolved, depending upon the nature of the rocks, soil, vegetation, sewage and industrial waste, with which it may come into contact.

Steam generation is a continuous process, fresh feed water being supplied to the boiler as the water evaporated into steam leaves it; this results in a continual concentration in the boiler of the impurities introduced with the feed water, since none but volatile impurities pass out with the steam. The non-volatile impurities collecting in the boiler, manifest themselves as suspended matter, scale, corrosion, or by an increased density of the boiler water.

The suspended matter may be carried in with the feed, or may be due to substances forced out of solution as a result of either heat or concentration, or both. Scale formation in the boiler is due to the action of heat, pressure, and concentration on the in the feed water.

Corrosion of the boiler is due to the introduction of gases and acids, or their formation from some of the impurities in solution in the feed water, by the reactions resulting from heat, pressure and concentration.

The increased density of the boiler water is due to the concentration of the sodium salts and of the scale-forming salts, to the limit of solubility.

Scale is one of the crucial items entering into boiler operating costs. It can nearly always be attributed to the lime and magnesia salts in solution in the water. The character of the scale depends on the acids combined with the lime and magnesia, on the type of boiler in use and on the rate, temperature, and pressure, at which the boiler is operated. For instance, the carbonates of lime and magnesia, when present alone, usually form a soft scale. The presence of calcium sulphate sometimes increases its hardness. A calcium sulphate scale is generally quite hard.

The following are a few of the items which, from an economic standpoint, make it almost imperative to prevent scale formation, or to at least remove it periodically:

1. Reduced evaporation due to the insulating effect of the scale on the heating surfaces of the boiler. 2. Cost of labor required for cleaning the boilers and auxiliaries. 3. Cost of repairs to boilers, necessitated by their being subjected to overheating on account of the heating surfaces being scaled. 4. Loss of efficiency and earning power of improved furnaces and stokers installed to increase evaporation, which correspondingly increases the concentration of

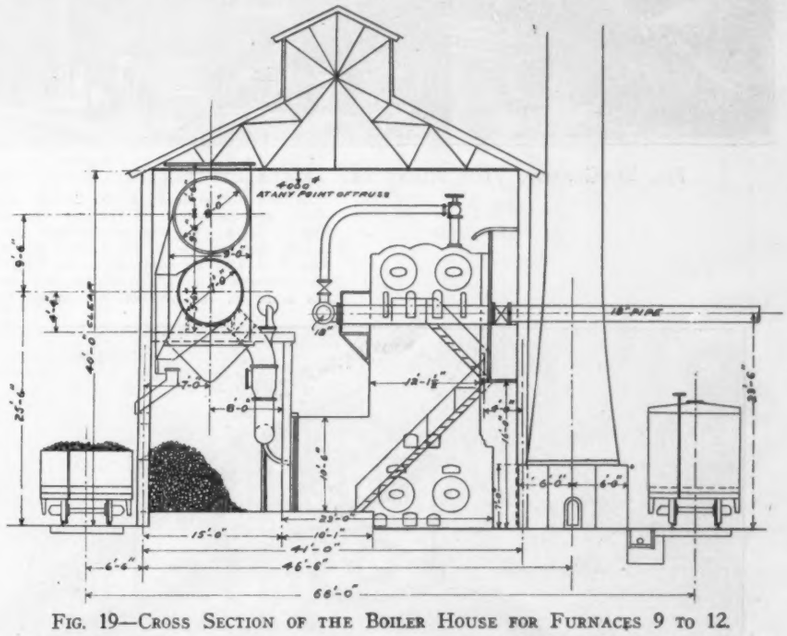


Fig. 19—Cross Section of the Boiler House for Furnaces 9 to 12.

In this boiler house are installed 6,400 horse-power of Rust boilers. The gas main from the blast furnaces passes through the boiler house into the dust leg shown in the cross section, which is located midway in the building. From this dust catcher the main is taken off to the blowing engine house and electric power station.

[1]Abstract of a paper read before the American Institute of Chemical Engineers at the Pittsburg (Dec. 28, 1908) meeting.

[2]Manager water purifying department, Wm. B. Scaife & Sons Co., Pittsburg.

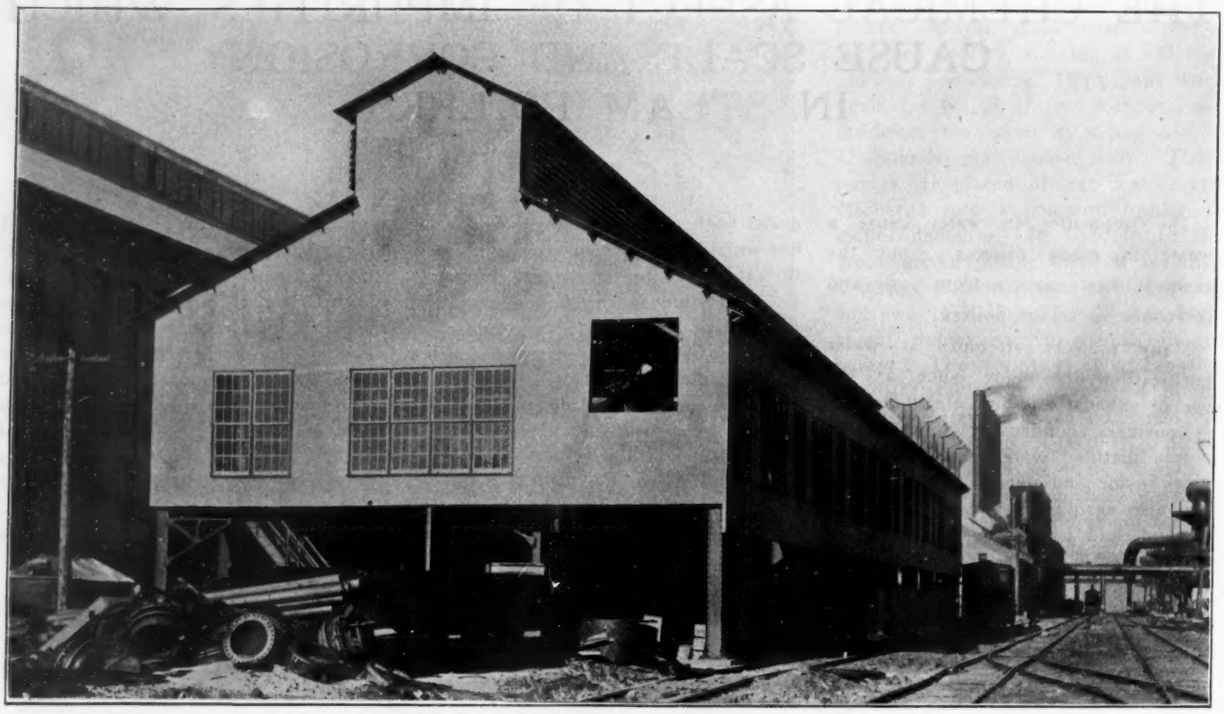


FIG. 20—GENERAL VIEW ALONG THE TRACKS BETWEEN THE BLAST FURNACE PLANT AND THE BOILER HOUSE.

In the foreground is the boiler house, in which are installed the boilers for furnaces Nos. 5 to 8. In the background the stacks shown are for the boiler houses for furnaces Nos. 9 to 12. In contrast to the boiler houses for furnaces 9 to 12, the other will carry the gas main on the brackets shown on the roof.

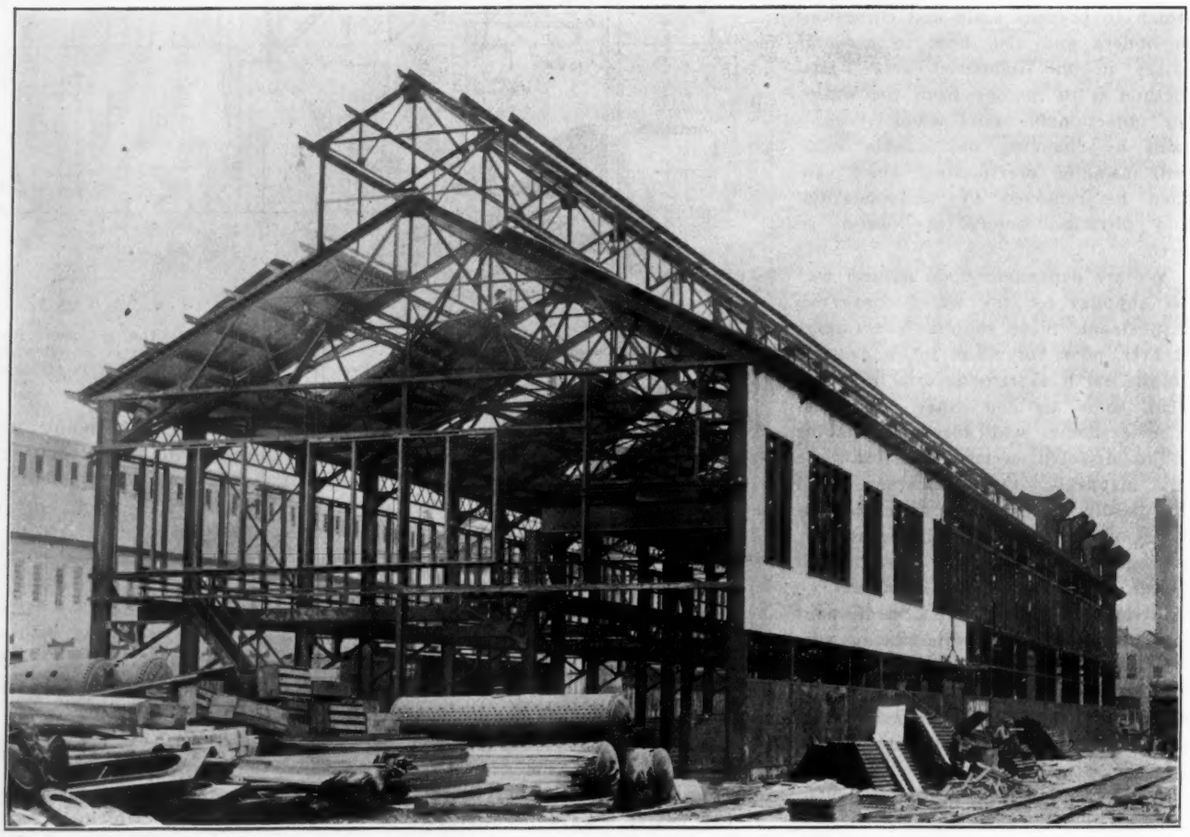


FIG. 21—CHARACTER OF THE STRUCTURAL WORK AND THE BOILER HOUSE FOR FURNACES 5 TO 8 DURING COURSE OF CONSTRUCTION.

impurities, thus forming a greater deposit of scale, and hence a greater reduction in the efficiency and life of the boilers. 5. Cost of tube-cleaning machines, repairs to them, interest and depreciation on money invested, and labor and power required for operating them. 6. Cost of boiler compounds, or any substances introduced into the boiler to prevent the adherence of the scale-forming matter to the shells and tubes. 7. Loss due to the investment in spare boilers to be put into commission when it is necessary to take boilers out of service for cleaning or repairs. 8. Waste of fuel due to heat loss in cooling a boiler for cleaning or repairs, and that required to again bring it to steam. 9. Loss due to reduced efficiency of boiler auxiliaries, especially in the feed water heaters and economizers, resulting in lower temperatures of feed water, thus materially increasing fuel consumption.

The salts which enter into scale formation, and their general characteristics, are as follows:

Calcium Carbonate.

This salt is the solution in natural waters as the bicarbonate. On heating the water, carbonic acid is driven off and the normal carbonate is precipitated to the limit of its solubility, which in distilled water is about 2 grains per United States gal-

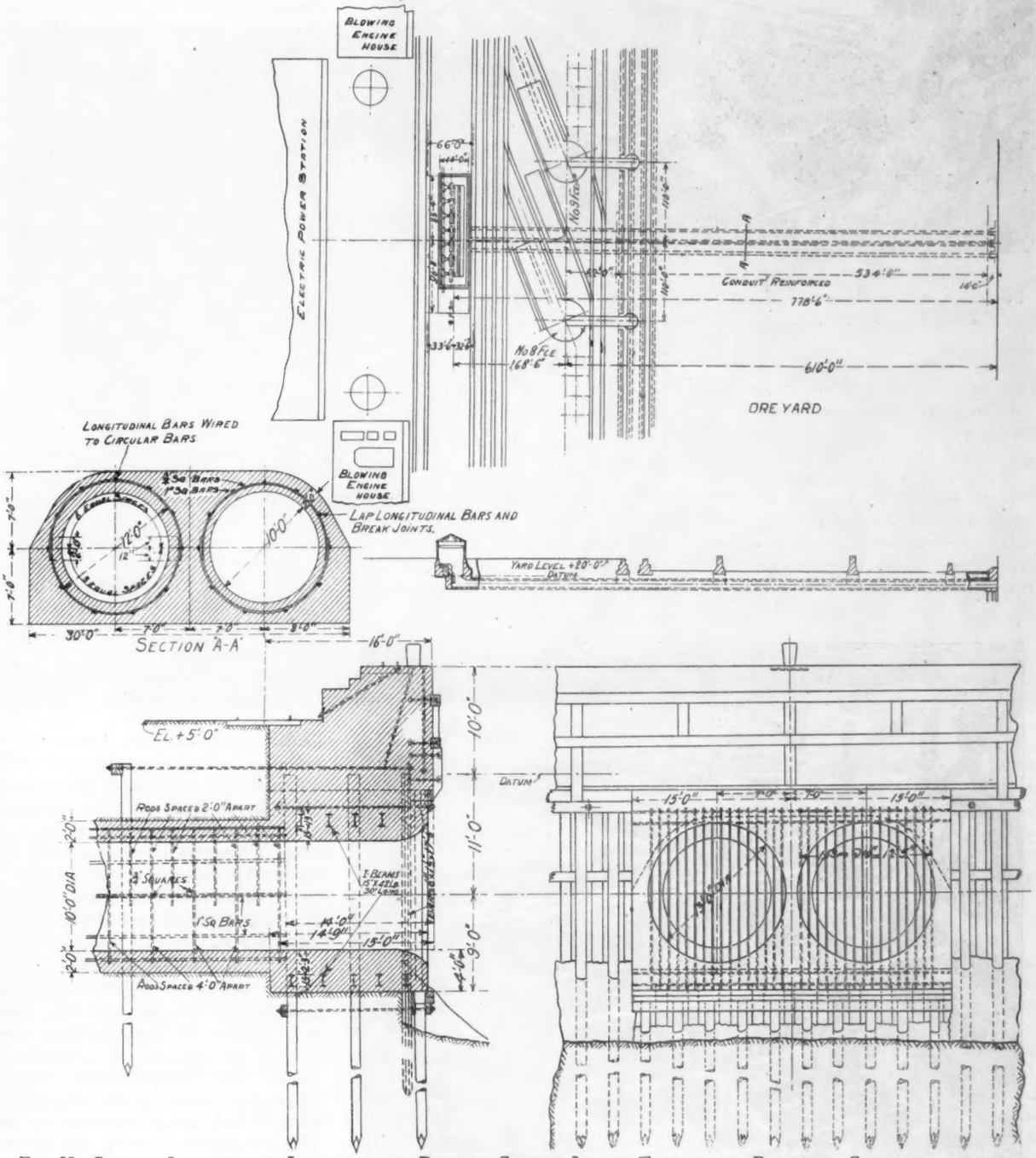


FIG. 22—GENERAL LOCATION AND LAYOUT OF THE PUMPING STATION INTAKE TUNNEL AND DETAILS OF CONSTRUCTION FOR THE REINFORCED CONCRETE WORK.

The intakes are 10 feet in diameter and 778 feet 6 inches long.

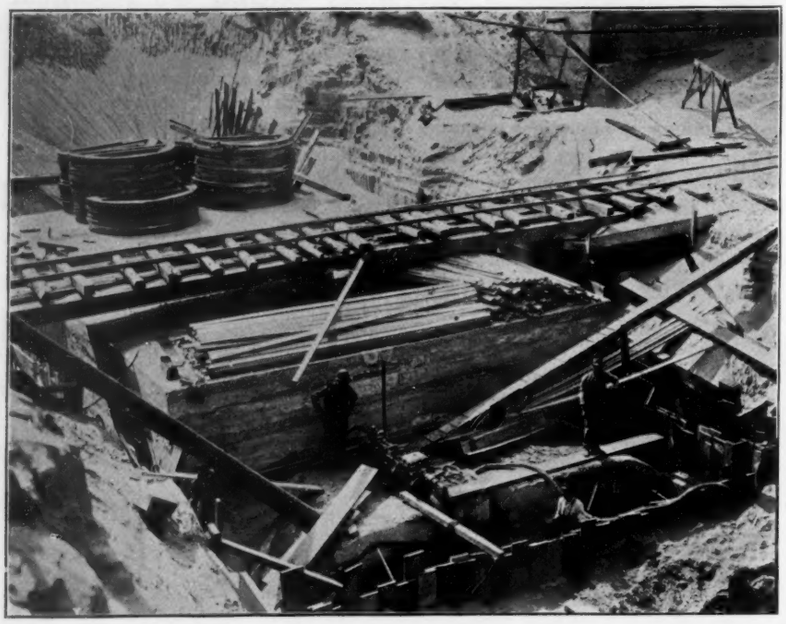


FIG. 23—CONCRETE INTAKES, WITH A SPECIAL CONCRETE CONSTRUCTION USED IN BUILDING UNDER THE ORE BIN FOUNDATIONS.

lon, but in waters containing other salts at boiler temperatures and pressures it varies from about 1 to 5 grains per United States gallon. The precipitation of calcium carbonate by heat is practically complete at about 300° Fahr. The precipitation, however, starts as soon as the temperature of the water is raised and continues until the limit is reached.

The amount of calcium carbonate left in solution in the water depends upon the other salts in solution. Heat alone will effect the removal of both the free and half-bound carbonic acid, therefore calcium carbonate will be precipitated, and the precipitate may eventually deposit as scale. The formation of scale from precipitated calcium carbonate depends upon the other substances in solution and the conditions under which the boiler is operated. For instance, if the water contains sodium carbonate, the chances are that the calcium carbonate will be precipitated as sludge. If, on the other hand, the water contains calcium sulphate, the cementing action of the calcium sulphate will tend to form a hard scale, the hardness of which will depend upon the amount of calcium sulphate in solution in the water, and the rate, temperature and pressure under which the boiler operates.

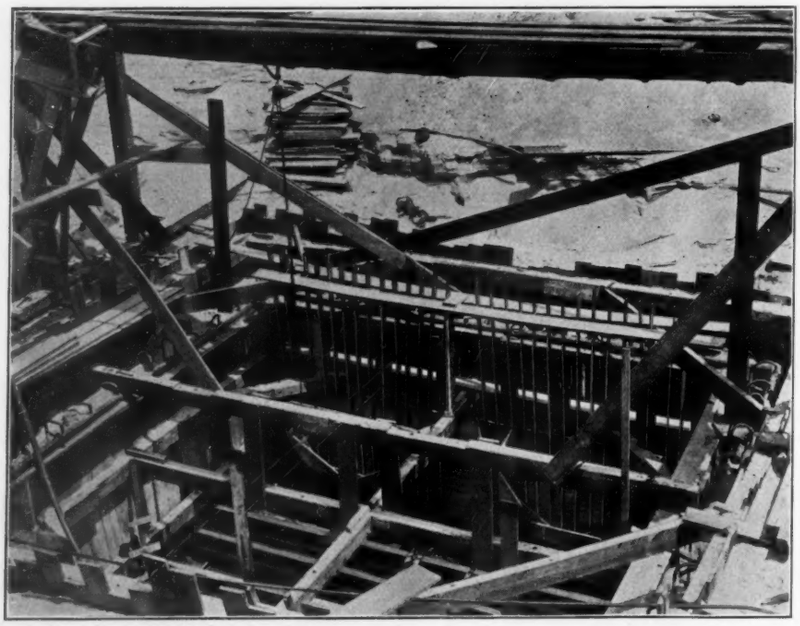


FIG. 24—OPENING FOR THE CONCRETE INTAKES AT THE SLIP THROUGH WHICH WATER IS CARRIED TO THE PUMPING STATION.

Magnesium Carbonate.

This substance has the same general characteristics as calcium carbonate, being held in solution as the bicarbonate. The normal magnesium carbonate, however, is more soluble than the normal calcium carbonate. Further, magnesium carbonate is quite easily dissociated as a result of heat, liberating carbonic acid and precipitating magnesium hydrate, which, at all temperatures, is very insoluble, rarely over ½ grain per United States gallon.

Calcium Sulphate.

This sulphate is soluble in natural waters to over 100 grains per United States gallon, and under boiler temperatures and pressures to approximately 25 grains per United States gallon, depending upon the other salts in solution. It is quite generally stated that calcium sulphate is insoluble at 300°Fahr. This may be the case in a solution of calcium sulphate in distilled water, but it is not the case with natural water supplies or those containing other salts in solution. The analyses of hundreds of samples of blow-off waters show calcium sulphate present to the extent of 25 grains, where temperatures far above 300°Fahr are maintained. The amount held in solution at boiler temperatures depends upon the amount of other substances in solution, and also upon the rate of concentration of those impurities. Calcium sulphate generally gives a hard scale, deposited in layers.

Magnesium Sulphate.

This substance at boiler temperature is quite soluble, and when present alone is not likely to form scale, but in the presence of calcium carbonate will react with it, forming magnesium carbonate and calcium sulphate. Magnesium sulphate is also objectionable because it reacts with sodium chloride, forming a very soluble sodium sulphate and magnesium chloride. This reaction is the result

of heat and concentration in the boiler.

Calcium Chloride.

This lime salt is very soluble at all temperatures, its solubility increasing with the temperature. It is, however, a fact, that with the increase of calcium chloride as a result of concentration, a point is reached where the calcium chloride begins to be dissociated, forming calcium hydrate and hydrochloric acid. The calcium hydrate is quite insoluble at boiler temperatures. Analyses of scale and sludge from boilers fed with water containing much calcium chloride show calcium hydrate, and evidences of corrosion, no doubt due to hydrochloric acid, are usually found. The calcium hydrate formed as a result of this reaction may combine with carbonic acid, either introduced with the feed water or that liberated as a result of heat, and form calcium carbonate.

Magnesium Chloride.

This chloride has the same general characteristics as calcium chloride, except that it is more easily dissociated, and whenever present, scale and corrosion result. The scale is due to the magnesium hydrate precipitated, and the corrosion, to the hydrochloric acid liberated. In waters containing calcium carbonate, the hydrochloric acid thus formed may be neutralized by the calcium carbonate, forming the calcium chloride and liberating carbonic acid.

Calcium and Magnesium Nitrates.

These salts have the same general characteristics as the calcium and magnesium chlorides, but the quantities present in most feed waters are usually so small that not much consideration is given to them. However, there are some water supplies in which these salts are present to such an extent as to cause both scale and corrosion.

FIG. 25—INTERIOR VIEW OF THE CENTRAL PUMPING STATION.

There are installed here six motor-driven turbine pumps, each having a capacity of 25,000,000 gallons per day. The plunger pump shown is used for auxiliary service. Located in the end of the station, but not shown in the cut, is a steam turbine-driven pump having a capacity of 20,000,000 gallons per day. Through this station water for the entire plant is pumped, the total capacity of the pumping plant being 180,000,000 gallons every 24 hours.

Silica.

The silica in solution in a water usually does not exceed 2 or 3 grains per United States gallon, and by itself will not form scale, but it is always found in the scale when present in the feed water. Silica under boiler temperatures may react with sodium chloride, forming a sodium silicate and liberating hydrochloric acid.

Organic Matter.

The substances included under this general term play a very important part in the formation of scale, and in many cases when present cause the formation of a hard scale which otherwise might be quite soft. The reverse is also true with some forms of organic matter. Then, again, some organic matter may prevent the formation of scale by increasing the solubility of some of the lime and magnesia salts.

Sodium Salts.

These are present in nearly all water supplies and cannot be classed as scale-forming matter, although present to a slight extent in nearly all scale; this is due to their being present in solution in the water, mechanically held by the scale, rather than from being forced out of solution, for long before such saturation is reached, it becomes impossible to operate the boiler.

Corrosion.

Corrosion is the most dangerous of the various troubles due to impure feed water, and the one in many cases the most difficult to overcome. It is usually due to the acids introduced into the boiler in the feed water, or those formed as a result of reactions between various substances in solution, caused by heat and concentration; in some cases it is due to the oxygen of dissolved air. The different acids cause different kinds of corrosion, and it occurs in dif ferent parts of the boiler, depending upon the nature of the acid.

The action of corrosive acids and salts on the boiler makes operation dangerous and add to the expenses, as follows:

1. Danger of rupture or explosion due to weakening of the parts. 2. Repairs made necessary by corrosion. 3. Boilers out of service, making spares necessary. 4. Heat wasted in cooling boilers for repairs and fuel required to again bring them to steam. 5. Loss due to cost of boiler compounds to prevent corrosion.

The various gases and acids entering the boiler and causing corrosion, are as follows:

Oxygen.

Nearly all waters contain more or less oxygen dissolved from the air. The oxygen of the air is more soluble than the nitrogen, and is frequently the cause of pitting and grooving, especially in those parts of the boiler where the temperature is low, and the circulation slow, such as, for instance, in the mud drums of those types of boilers in which the mud drum is not in the direct path of circulation. The corrosion by oxygen is the direct formation of the various oxides of iron. It is next to impossible to overcome this form of corrosion, as there is no practical way of removing the dissolved oxygen from the water. The corrosion, however, is of a mild form and does not, except in rare cases, cause much trouble. The cases where trouble from this source is experienced can almost always be charged to the design of the boiler, for if the circulation is as rapid as it should be and all of the boiler water moving, the oxygen will go off in steam, possibly causing some corrosion at or above the water line, but not generally to an appreciable extent.

Carbonic Acid.

This acid, which is mixed with the air to the extent of about 0.04 per cent, is present in all natural water supplies. It is absorbed by the water, in which it is quite soluble, from the air. The corrosion caused by carbonic acid is usually indicated by pitting and grooving, and it is shown not only in the water space of the boiler, but also above the water line and in steam lines; its corrosive action is much greater when oxygen is present with it.

Hydrochloric Acid.

This acid is rarely if ever present in natural waters, but is formed as a result of the decomposition of some of the chlorides, and reactions between such substances as magnesium sulphate and sodium chloride, and attacks surfaces exposed to steam. Hydrochloric acid is volatile, also very soluble; therefore corrosion is shown both above and below the water line. This acid attacks the iron, forming the unstable iron chloride which, at boiler temperatures, is dissociated, the iron being precipitated as the oxide, or hydrate, and the acid thus liberated combines with more iron from the boiler, and is in turn again set free. In this way the corrosion goes on indefinitely, constantly increasing in its action on account of the continued increase in the acid contents of the water by the acid that is liberated from the impurities in the water being added to the acid formed by the decomposition of the iron chloride. This concentration of the acid does not take place above the water line, but the heat there is sufficient to dissociate the iron chloride. Corrosion from this cause is usually shown by pitting and grooving, rather than over the entire surface.

Sulphuric Acid.

When this acid is present in a natural water supply it is due to drainage from coal mines or industrial plants. It is not volatile and its action shows only below the water line. Its action on the iron of the boiler is similar to that of hydrochloric acid, except that it forms the iron sulphate, which in turn is dissociated into sulphuric acid and the iron oxide, or hydrate. This iron oxide usually forms a part of the scale, or is present in the water as suspended matter, giving to the water the characteristic red color of iron rust. A feed water containing only a small amount of sulphuric acid will produce active corrosion, resulting in the destruction of the boiler, on account of the continual formation of iron sulphate and its dissociation into sulphuric acid and iron oxide or hydrate.

Many water supplies, especially those contaminated with the waste from galvanizing plants, contain iron sulphate, which, under boiler temperatures, is immediately dissociated.

Organic Acids.

Under this head are included acids such as tannic and acetic. They are usually the result of contamination from vegetable or organic matter. The corrosion from organic acids is comparatively mild, but occurs to a greater or less extent, and is very similar to that from the other acids. However, the amount of such acids present in most waters is usually so small that little attention need be paid to it.

Density of Water in Boilers.

The increase in density of the water in the boiler cannot be prevented, for the evaporation of water into steam leaves the sodium salts in solution; and there is no means by which these salts can be removed from the water, either before or after it enters the boiler. By frequent blowing off the concentration of the sodium salts in the water in the boiler can be reduced, but not entirely prevented.

That portion of the scale-forming salts soluble at boiler temperatures and pressures also increases the density of the water, but these salts are constantly concentrating and precipitating, so that after a certain point is reached for uniform pressure and rate of operation, the analysis of boiler water will remain practically the same, with the exception of a variation in the calcium sulphate and an increase in the sodium salts.

Scale and corrosion are closely related, because of the number of salts which, as a result of heat and concentration, either decompose or react, forming salts and liberating acids, the precipitated salts forming scale and the acids causing corrosion.

The analysis of the water is of undoubted value in determining the substances in solution. There is, however, among chemists, a wide difference of opinion as to the proper method of making combinations from the determinations of the various substances in solution. Experience enables a chemist to formulate certain rules, and by careful observation during the course of the anaylsis, to note the salts present in a particular water. But in reporting the nature of the possible scale formed by a certain water, or the corrosion which might result from its use, not only the analysis of the water must be taken into consideration, but the reactions between the various salts in solution. These reactions, however, do not take place to the same ex-

tent in all waters. The amount of scale-forming impurity in the feed water rarely, if ever, bears a direct relation to the substances in solution in the water after concentration in the boiler, but it does to the amount of scale or sludge formed. However, there is a close relation between the amount of sodium salts introduced with the feed water and the amount found in the boiler water after concentration, this ratio indicating approximately the number of concentrations.

It cannot be definitely foretold that in a certain water containing both magnesium sulphate and sodium chloride there will be a reaction between these salts, yet hundreds of blow-off analyses show the results of these reactions, and the boilers show corrosion resulting from the liberated hydrochloric acid.

It therefore means a careful study of the water and the conditions under which the boiler operates, to determine whether scale or corrosion would result from the use of a certain water. It is almost impossible to predetermine the nature of scale from the analysis of the water. The only safe way is to feed water into the boilers free from those substances which scale and corrode. Such general statements that waters containing only the carbonates of lime and magnesia will form a comparatively soft scale, and that the calcium sulphate will form a hard scale, and further, that it will increase the hardness of the carbonate scale, should be made with caution, for there are hundreds of instances where a hard scale is formed from waters containing only the carbonates of lime and magnesia, and also where the scale is quite soft in the presence of considerable calcium sulphate.

The nature and amount of scale formed in a boiler depends largely on the rate at which the boiler operates. For instance, in some boiler plants operating considerably below their rating, and fed with water containing as high as 30 grains of both carbonate and sulphate scale-forming salts, in a given time comparatively little scale is formed, and that quite soft; while in others, where the water contains only about 10 grains of these same salts, and the boilers are worked above rating for the same time, a considerable deposit of hard, tenacious scale is formed. The type of boiler also has a bearing on the hardness of the scale. The scale in the water tube is generally harder from the same water than that formed in the return tubular boiler, or in the old two-flue boiler.

It is an easy matter to determine the amount of impurities carried into the boiler with the feed water, but it cannot be definitely stated how much sludge or scale will be formed. Both are objectionable and have no place in the boiler. To obtain the maximum result from the fuel consumed and the full value of improved furnaces, the best water obtainable should be fed into the boilers. If the water is not of the proper quality, but is one that will deposit sludge and scale, or cause corrosion, then it should be softened and purified.

Purification of Water.

To properly soften and purify a water means, primarily, a properly designed apparatus in which are met the requirements for complete chemical reaction. These may be summed up as follows:

1. An accurate chemical treatment, accomplished by the introduction of the proper reagents in exact quantities to react with the impurities in a definite quantity of water. 2. Thorough mixture of the reagents with the water to insure complete chemical reaction. 3. Accelerated chemical reaction; brought about by a thorough mixture of the reagents and water, and by mixing the sludge of the previous softening with the new finely divided precipitate. Heat will hasten the reactions, but it is not essential. 4. A complete chemical reaction, brought about by a thorough mixture of the reagents with the water and by having the apparatus large enough to allow sufficient time for all the reactions to take place, and the apparatus so designed that every part of it is effective. 5. A rapid sedimentation, by having the new finely divided precipitate weighted by the sludge of previous precipitation, to cause it to settle more rapidly and perfectly. 6. A perfect clarification, by allowing time for sedimentation and final clarification by perfect filtration.

The proper softening and purification of water is, in a sense, a very delicate operation, notwithstanding the large quantity of water usually handled. It is not merely a matter of lime and soda ash, but the intelligent use of the proper reagents to bring about softening and purification for a particular water supply, with neither an insufficiency of reagents nor too great an excess. A water containing 30 grains per United States gallon of scale-forming matter is harder than the average, yet in percentage this means only 0.05 per cent of scale-forming impurity. Such a water completely softened should not contain more than 3 grains of scale-forming matter, or, in percentage, only 0.005 per cent. When these facts are considered, some idea is obtained of the accuracy of the treatment required for completely softening water. Of course, any reduction of the scale-forming salts is an advantage, but the maximum reduction can usually be obtained for very little extra expense with a properly designed apparatus, when such apparatus is given the necessary attention.

If a water supply contains less than 4 grains of lime and magnesia salts, but contains suspended matter, it should be clarified by sedimentation and filtration. If the water contains more than 4 grains of scale-forming salts, it should be softened and purified, that is the reduction of the soluble impurities (not including the sodium salts, which can not be removed) to a point where an analysis will show quantities about as follows: Volatile and organic matter, 1 grain; silica, ½ grain; oxides of iron and alumina, trace; calcium carbonate, 2 grains; magnesium hydrate, ½ grain; but no other compounds of lime and magnesia. Suspended matter should never be more than a trace. Such a water will not form scale or cause corrosion. It will not form scale because the amount of scale-forming salts left in solution is too small, even with concentration, to form anything but a slight sludge. This sludge can be kept at a minimum by proper blowing off, and the boiler, no matter how long it is in operation, will, on being opened, have the appearance of having been whitewashed; the iron of the boiler can be exposed anywhere by rubbing with the finger or washing out with a good pressure. Corrosion cannot take place because the water is slightly alkaline and does not contain either corrosive acids, or salts which, by dissociation or reaction, will form corrosive acids.

The stockholders of the Newcastle & Ohio River Railroad Co. have authorized an increase in the capital stock from $1,000 to $10,000. The line is a short ore-carrying road at Hanging Rock, O., controlled by Rogers, Brown & Co.

The Fitchburg Steam Engine Co., located at Fitchburg, Mass., having a capital of $40,000, has been authorized to locate in Illinois with a capital of $5,143,000.

STANDARD PUNCHES, DIES AND COUPLINGS

By C. C. Swift.

Every shop that operates a punching machine uses punches, dies and coupling nuts of some description. The tools might have been of some known standard when the machine was purchased, but the question that should be looked into by the superintendent or foreman is whether they are standard at the present time or not. It seems to be the usual rule where companies make their own

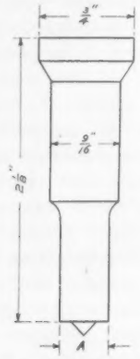


Fig. 1—Punch for Holes 1/8-Inch to 9/16-Inch Diameter.

tools, unless special care is exercised that each succeeding lot made up differs slightly from the previous lot, so that in the course of a few years the tools become special for that machine.

When a company operates more

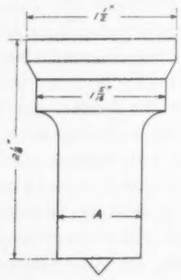


Fig. 4—Punch for Holes 1⅛-Inch to 1 5/16-Inch Diameter.

than one punching machine, and the above conditions prevail, the result is not merely continued annoyance but the added expense of having a stock of tools for each machine. A far better way is to arrange the machine to hold standard tools, so that the couplings, punches and dies used in one machine can be used on any other machine of like capacity in the shop. In doing this, it is advisable to adopt a standard which will permit the widest range of punching at the least cost. In other words, the most economical system is the one that requires the least number of punches, stems and coupling nuts to accomplish a wide range of punching, it being understood that the punches are made out of the smallest amount of steel necessary, and that they conform to accepted designs.

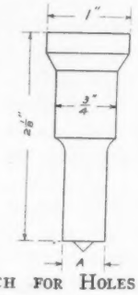


Fig. 2—Punch for Holes 5/8-Inch to ¾-Inch Diameter.

A company building punching machinery, and thus in close touch with the requirements of such tools, certainly should know what the trade desires. Punches are subjected to sudden and excessive shocks and the ability to harden and temper tools of this description comes only after long years of experience in this class of work alone. In purchasing standard material, not only can one obtain a low price, due to the fact that such tools are made up in large lots, but

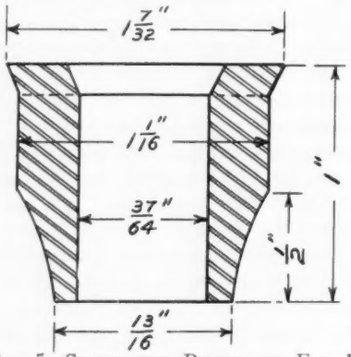


Fig. 5—Sleeve for Punch in Fig. 1.

immediate delivery can also be had and this latter feature generally means a great saving.

In standardizing a machine, it is necessary to design a punch stem that will permit the use of an economical punch, and, at the same time, give wide range of punching. Punches made out of ¾-inch stock, 1½ inches long, are the cheapest that can be made for punching 7/16-inch and 9/16-inch holes, but, if it is desired to punch 11/16-inch or 13/16-inch holes, a new stem and coupling nut would have to be used.

If, however, a stem was designed to hold an economical 13/16-inch or 15/16-inch punch, a punch made out

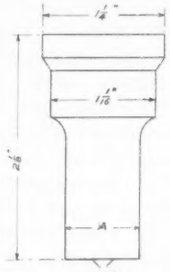


Fig. 3—Punch for Holes 13/16-Inch to 1 1/16-Inch Diameter.

of say 1¼-inch stock with a special arrangement for holding the smaller punches in the same coupling nut, would accomplish the desired result.

At the present time, there are some half a dozen different standards established by different builders of punching machinery for punches, dies and couplings. While it would be of untold advantage to have a single

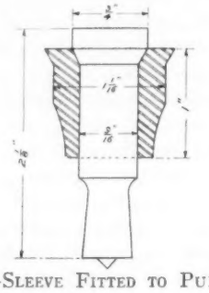


Fig. 6—Sleeve Fitted to Punch in Fig. 1.

standard, so that where a shop is equipped with several different makes of punches, the same couplings, dies, etc., could be used on all, yet this is a condition which could only be brought about through the adoption of some standard by an association which is influential, not only in the boiler making, but also in the structural, bridge and sheet metal working shops all over the country. Since this condition is not likely to be ful-

filled, at least for the present, boiler makers and structural steel workers can even now avail themselves of an economical standard for their punches, dies and couplings.

The illustrations here used are taken from the stock list published by the Cleveland Punch & Shear Works Co., Cleveland, and show the manner in which this company has brought about standardization in its punches, dies and couplings.

Figs. 1, 2, 3 and 4 show punches suitable for punching holes from ⅛-inch up to 1 5/16-inch in diameter, Fig. 1 being used for diameters from ⅛ inch to 9/16 inch; Fig. 2 from ⅝ inch to ¾ inch; Fig. 3 from 13/16 inch to 1 1/16 inch; Fig. 4 from 1⅛ inch to 1 5-16 inch. Fig. 3 fits coupling nut No. 3½ shown in Fig. 8, the shank of the punch being 1/64 inch less than the bore of the nut. The sleeve shown in Fig. 5 fits the punch shown in Fig. 1, as shown in Fig. 6. Similarly the sleeve shown in Fig. 7 fits the punch shown in Fig. 2. These sleeves permit the use of coupling nuts No. 3½ with the punches shown in Figs. 1 and 2. There is no appreciable wear on these sleeves, so that they could be taken off a punch after it wears out and placed on a new one.

With the equipment noted, one stem and a No. 3½ nut, the range of

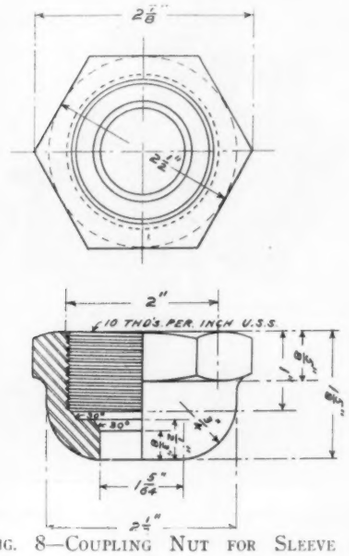


Fig. 8—Coupling Nut for Sleeve in Fig. 7.

punching is from ⅛ inch to 1 1/16 inch inclusive, and the small diameter punches are made out of as little stock as is consistent with good design. If it is desired to punch holes from 1⅛ inch to 1 5/16 inch it is still unnecessary to change the stem. The result is accomplished by using the punch shown in Fig. 4, which will fit nut No. 3½ if the bore is enlarged to 1 21/64 inch bore, is called nut No. 4 and is shown in Fig. 9.

The range of punching from ⅛-inch to 1 5/16-inch is accomplished on one stem, and has been described. If it

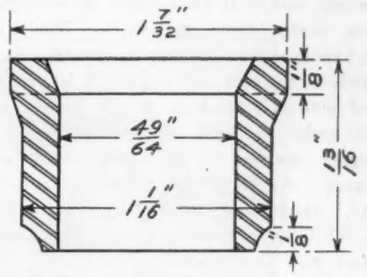


Fig. 7—Sleeve for Punch Shown in Fig. 4.

is desired to punch larger holes it will be well to take the matter up with a machine tool builder, explaining the nature of the work, so that the punches may be manufactured in the most economical manner possible.

THE "KESCO" FLOOR PLATE.

The marked development and improvement in mill practice and equipment which has added much commercial value in recent years, to various steel mill products, particularly those entering into building construction, is noticeable in the special wrought steel floor plates and shapes produced by the Keystone Steel Co, Warren, Pa. These plates are specially suitable for fire escapes, stairways, trench covers in steam heating plants, floors in power houses and for many other similar uses.

As manufactured by the Keystone Steel Co., these plates are of open-hearth boiler steel material. By reason of their high ductility they will sag and bend when overloaded, thus giving ample warning of any impending danger. "Kesco" plates, as they are known to the trade, can be punched with an ordinary structural punch or cut with a cold chisel. The strength of the material is such that a 5/16-inch plate weighing 13¾ pounds per square foot, will carry 222 pounds on a 3-foot span. A point of economy in their use by contractors is that 30 per cent less material is required to be handled, with the further fact that the floor and stair supports having to carry less load, may be lighter.

The expansion in the trade of the Keystone Steel Co. has been such as to justify the purchase of property and the erection of mills at Wilmington, Del. These mills are specially adapted to the company's line of manufacture and include the largest and most efficient equipment. Facilities are provided whereby the diamond, ribbed and checkered patterns of wrought steel floor plates and threads can be rolled absolutely straight and flat, as well as accurately sheared to specified size and form. This latter arrangement effects a saving to the users of the material, by avoiding the time-consuming and expensive necessity which has previously existed, of straightening and trimming to proper size by hand, after the plate had been delivered.

The importance of accurate cutting to specified size and shape has warranted the company in installing shears of the most improved type and largest capacity, which have been especially built for this work. With its new mill facilities, the company is now in a position to roll plates of any thickness from ⅛ to ¾ inch or thicker, if desired, and of larger maximum size than it has heretofore been possible for any other mill to furnish.

Of the diamond pattern of plates the maximum sizes which can be supplied range from ⅛-inch thick, 44 inches wide and 120 inches long, weighing eight pounds per square foot, up to ¾-inch thickness, 60 inches

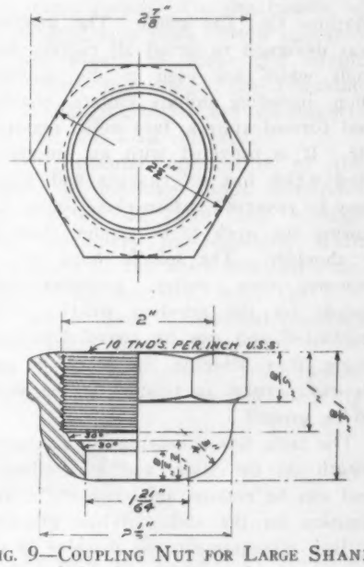


Fig. 9—Coupling Nut for Large Shank Punches.

wide and 96 inches long, weighing 32 pounds per square foot, or 37 pounds per square foot for the ⅞-inch gage. The maximum sizes of the ribbed pattern are from ⅛-inch thick, 42 inches wide and 120 inches long, weighing nine pounds per square foot, up to ¼-inch thick, 72 inches

wide and 96 inches long, weighing 33 pounds to the square foot, or 38 pounds to the 7/8-inch gage, and of the checkered pattern 3/16-inch thickness, 48 inches wide and 48 inches long, and heavier.

A NEW UNIVERSAL AND TOOL GRINDER.

The accompanying illustrations show features of the Oesterlein No. 3 universal and tool grinder, which has been placed on the market by the Oesterlein

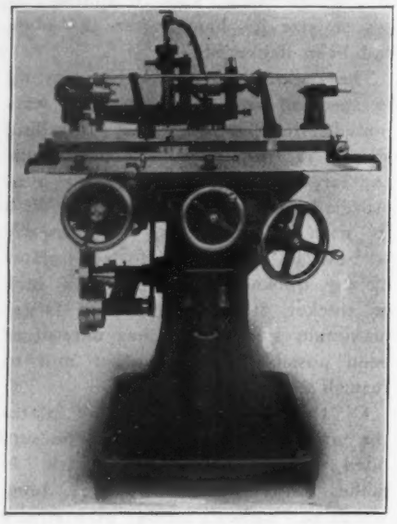


FIG. 1—THE OESTERLEIN GRINDER.

Machine Co., Cincinnati. The machine was designed to grind all cutters and tools which are used in the machine shop, including milling cutters, angular and formed cutters, face mills, reamers, etc. It is provided with an automatic feed which has six changes and which may be reversed within close limits, allowing the work to be ground close to a shoulder. The spindle head has a two-step cone pulley, providing two speeds for the grinding wheel. It is graduated and can be swiveled to any angle, thus bringing the wheel in any desired position in relation to the work to be ground.

The table has a bearing for its entire length on the slide, and is graduated and can be rotated and clamped in any position on the slide. When grinding to inch measurement, the machine is set by means of a scale embedded in the slide, which indicates the amount of taper per foot. One end of the table is formed to a worm wheel, which engages a worm by means of which the table may be delicately adjusted to the desired taper.

The slide has a V and flat bearing on the saddle, and the saddle has a V and flat bearing on the knee. This insures that at all times the cross movement is at right angles to the longitudinal movement. The headstock may be swiveled to any angle in the vertical or horizontal plane and clamped in any position. The tailstock has a compensating center and is actuated by a lever, which makes it convenient to withdraw the center from the work. The vise when mounted on the headstock angle swivels through any angle; it is provided with a V-block to fit the lower jaw, in order to hold circular work. The upper jaw swivels to accommodate any taper. An adjustable center is provided, which acts as a back stop. The tooth rest is universal in construction, and has a micrometer adjusting nut for accurate setting to any position.

A hanger is provided for use on the drum countershaft, which obviates the

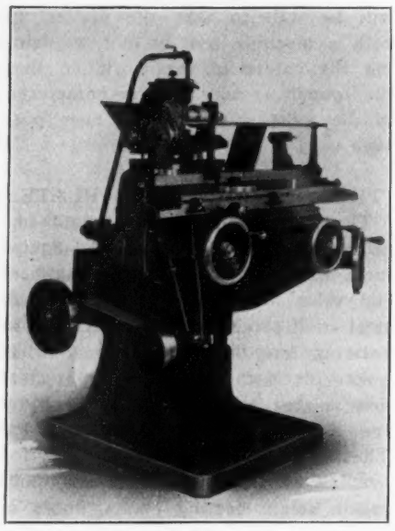


FIG. 2—OESTERLEIN GRINDER, SHOWING TABLE FEED MECHANISM.

use of a tight or loose pulley or a clutch pulley on this countershaft. The hanger is so swung that the distance between the main countershaft and the drum countershaft may be altered, thereby tightening the belt or allowing it to hang loosely on the pulleys. A half turn of a handle on the hanger causes it to swing forward and stretch the belt tight, thus driving the drum. When the handle is turned back, a brakeshoe presses against the flange of the pulley and the rotation of the shaft is stopped immediately.

The machine is provided with a tank and pump to supply an abundant amount of water for cylindrical work. The water guards and shields are adjustable and can be readily removed when not in use.

The general dimensions of the machine are shown in the following table:

Automatic table feed	16 inches
Transverse movement	8 inches
Vertical movement	7½ inches
Swings between centers	9 inches
Swings with raising blocks	12 inches
Takes between centers	24 inches
Speeds of wheel spindle	2,942 and 4,080 revolutions per minute
Table feeds	8, 11¼, 16½, 24, 34 and 50 inches
Net weight of machine	1,400 pounds

A NEW METHOD OF BORING SQUARE HOLES.

The accompanying illustrations show a tool which has been recently developed, whose purpose is to bore square holes or holes of other shape than round in iron and other metal. A process of this character is of considerable interest, in view of the wide use of holes of this shape for countersinking, for keys, wrenches, spanners, hand-wheels and similar articles. The present methods of making such holes, outside of punching and casting, require that they first be bored round and then worked up by hand or by means of a slotter or shaper, a slow and expensive process.

The apparatus shown herewith comprises a special drill and a special chuck, which latter is a device for making the drill travel in such a manner as to strike out a square hole in the work. The drill itself is a three-cornered boring tool somewhat similar in action to an end mill. The

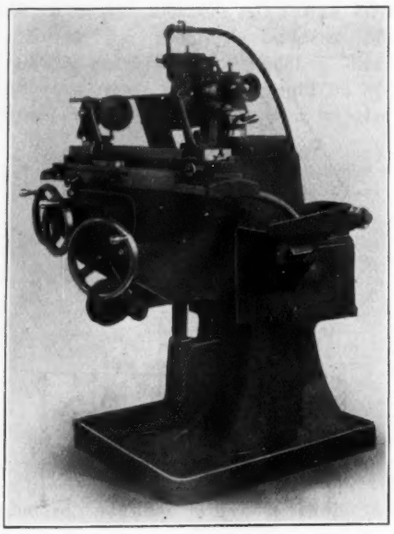


FIG. 3—OESTERLEIN GRINDER SHOWING MAIN DRIVE.

chuck consists of a driving bar, which is screwed on to the spindle of the machine and a guiding bar, which either rides upon the first part or is secured permanently to the frame of the machine, and a third bar, or socket, into which the shank of the drill is screwed. This third part is caused to rotate by the first part

of the chuck, but has a slight freedom of motion in relation to the first part, as it is guided in its exact movements by the frame of the stationary part. The shank of the drill, which rides in the stationary part of the chuck, is composed of three segments of circles, whose radii are equal to one of the sides of the square hole to be drilled. The centers of these segments are the opposite corners of the shank. The guide in the stationary part of the chuck is adjusted to the size of the hole to be drilled, so that the sides of the square opening in this part are just equal to the radius, by which the circles used as sides of the shank are made.

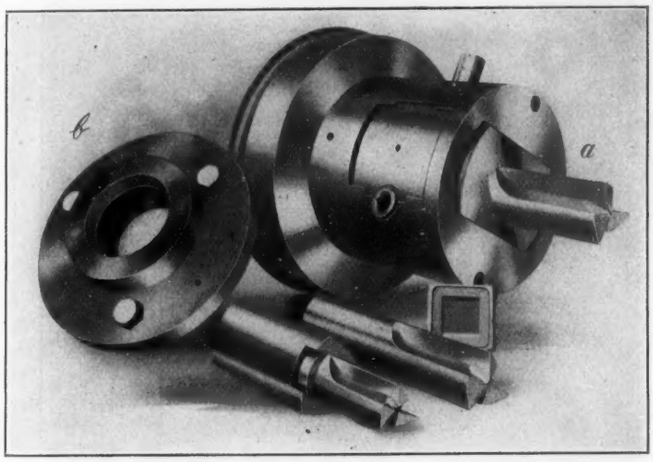


FIG. 1—MECHANISM FOR DRILLING SQUARE HOLES.

In operation, when one of the sides of the shank is either rolling or sliding upon one of the sides of the square guide, the opposite corner of the shank will move in a straight line in contact with the opposite side of the guide. The corresponding corner of the head of the tool will thus at the same time strike out a straight line in the work. This motion takes place on all four sides of the guide, excepting for a little space at each corner, the result being that a square hole is formed, except for a slight rounding at the corners. If it is desired to bore out a complete square with sharp corners, a special tool is employed, having a shank considerably larger than the head of the tool, one corner of the shank being rounded instead of angular.

The exact form of this round cornered shank has been worked out empirically and a complete set of templates has been made for the different sizes of tools usually required in actual practice. The tool for both the round cornered and sharp cornered squares can be ground by means of a special attachment on the ordinary grinding machine. This device was originally developed in Germany, and is in use in large numbers in the larger shops there. It is being introduced in this country by the Radical Angular Drill Co., 114 Liberty street, New York.

The Advance Stove Works Co., Evansville, Ind., has filed notice of the increase of capital stock from $100,000 to $150,000.

A NEW LIFTING MAGNET.

The accompanying illustrations show a new hand lifting magnet which has been placed on the market by the Cutler-Hammer Clutch Co., Milwaukee. This device weighs only about seven pounds, but is capable of lifting castings of from 10 to 15 times its own weight. It is designed for operation on 110-volt direct current circuits, and is finished with a drop cord and attachment plug so that it may be readily attached to an ordinary lamp socket. On the handle of the magnet is a push button operated by the thumb to close the circuit and excite the coils. On releasing the button the poles are de-magnetized and the load released.

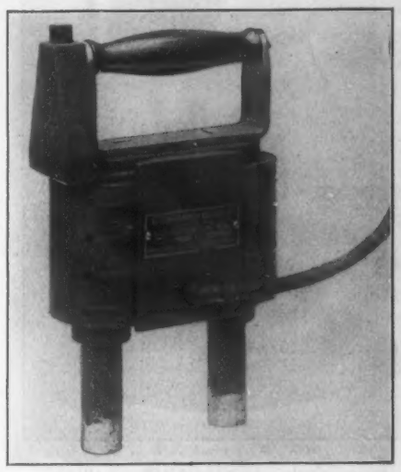


FIG. 1—CUTLER-HAMMER SMALL LIFTING MAGNET.

The particular application of the magnet in machine shops comprises the clearing of chips and borings from machinery or removing them from parts of the work not easily accessible; for instance, from the bottom of a deep cylindrical casting. Tools, bolts, boring bars, etc., which have fallen into places from which it would be difficult to fish them by

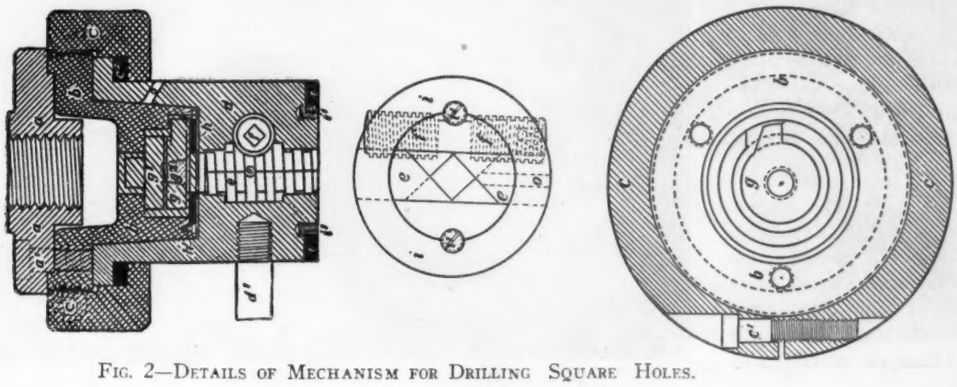


FIG. 2—DETAILS OF MECHANISM FOR DRILLING SQUARE HOLES.

ordinary means are easily recovered by the magnet. When large quantities of brass and iron filings accumulate, which it is desirable to separate before selling as scrap, the magnet is especially useful in sorting the brass from the iron.

In foundries the magnet may be of use to pick up hot or awkwardly shaped castings, or smooth plates, which are sometimes difficult to get

FIG. 2—CUTLER-HAMMER LIFTING MAGNET IN USE.

hold of when lying on a flat surface. It may also be used for cleaning molding sand of minute particles of metal. These are a few of the uses to which this handy little tool may be put, and many others will suggest themselves to users.

More Bog Ore.—We are advised that in addition to the bog ore deposits on Quatsino sound, Vancouver island, B. C., as noted on page 35 of the Jan. 7 issue of THE IRON TRADE REVIEW, there is another large body of very good ore located about four miles further west. There are several million tons in this deposit in sight and the bed has not been fully developed. The ore runs over 50 per cent iron. The beds are from 4 to 23 feet in thickness and are not stratified with clay or other impurities. The property is controlled by the Irondale Steel Co., of Irondale and Seattle, Wash.

The Baltimore Metal Stamping & Mfg. Co. has acquired property at 427 and 429 North High street, Baltimore, which it is improving and equipping with machinery for the manufacture of stamped metal products.

REMOVING OBSTRUCTIONS IN BLAST FURNACES BY MEANS OF OXYGEN.

In THE IRON TRADE REVIEW of May 23, 1906, there was published a paper which was read before the Iron and Steel Institute, detailing the use of oxygen in removing blast furnace obstructions. By the courtesy of F. H. Kindl, Pittsburg, we are enabled to present illustrations showing the use of this process. Figs. 1 to 3 show the progress of the work in opening up a blast furnace in which the tap hole had become chilled. A couple of instances of the performances of this process are given herewith.

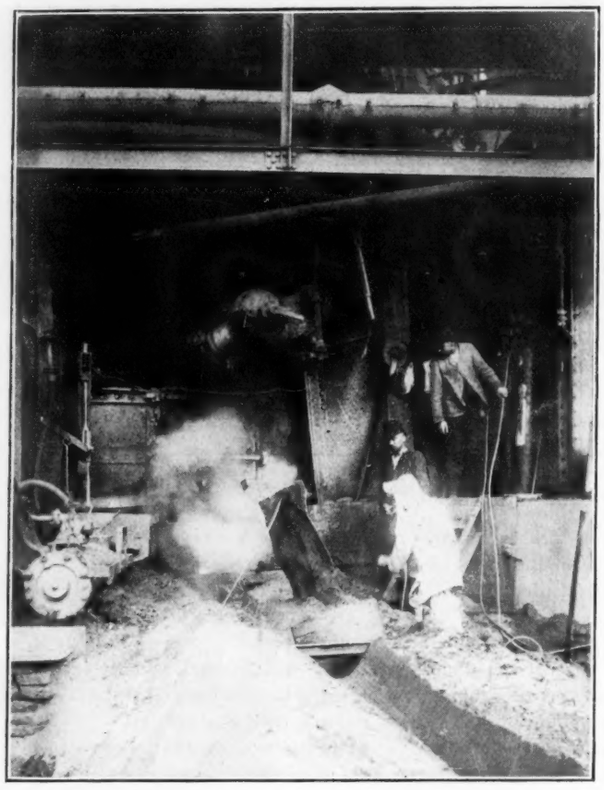


FIG. 1—OPENING UP FROZEN TAP HOLE—START.

The tap hole on one of the blast furnaces of the Warwick Iron & Steel Co., Pottstown, became chilled on Nov. 20, 1908. It was impossible

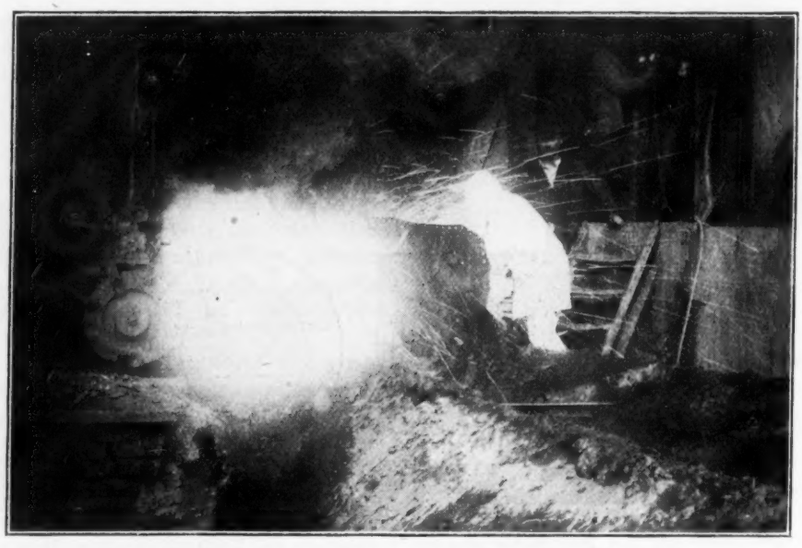


FIG. 2—OPENING UP FROZEN TAP HOLE—AFTER 30 SECONDS.

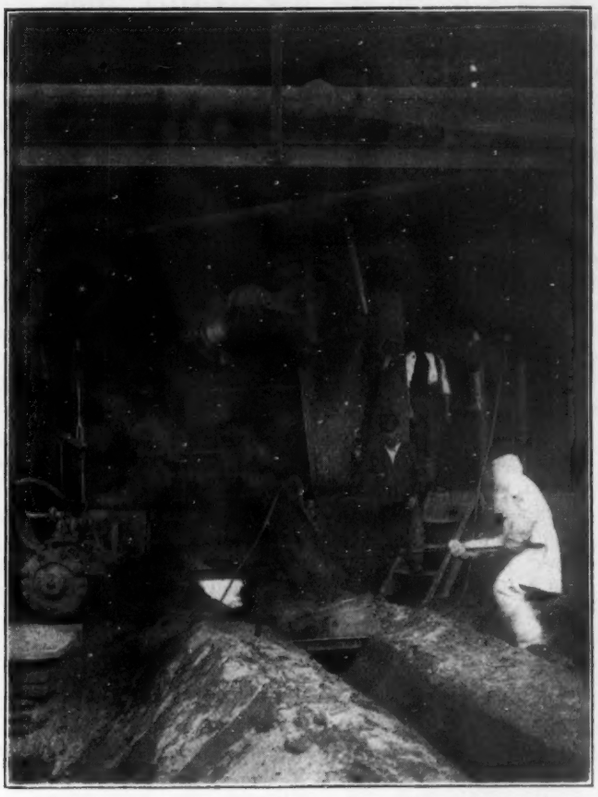


FIG. 3—OPENING UP FROZEN TAP HOLE—AFTER 60 SECONDS.

to open it by drilling, a gang of men having worked on it for one and a half hours. By the use of the oxygen blast the tap hole, which had become chilled to a depth of about 5 feet, was opened in four minutes with an expenditure of 40 cubic feet of oxygen. On Dec. 30, 1908, the tap hole on No. 5 furnace at the Central furnaces of the American Steel & Wire Co., Cleveland, became chilled. In attempting to open it by the ordinary methods, a steel bar, which had been used for drilling, after an hour's work, became stuck in the tap hole and could not be removed. The oxygen melting apparatus was applied and the tap hole was opened in 105 seconds with the use of about 50 cubic feet of oxygen. The hole had become chilled to a depth of about 4 feet.

In Fig. 4 is illustrated another use of this process, in which the oxygen blast is being used for the cutting off of the crank shaft of an engine, which is being dismantled. The introduction of this process has been delayed in the United States, on account of the lack of oxygen under high pressure. This is now being manufactured on a commercial basis in large quantities in this country and the process should shortly be available wherever needed. F. H. Kindl has been appointed sole representative in the United States of the Coeln Muesner Bergwerks Actien Verein, which controls the basic patents.

FIG. 4—DISMANTLING ENGINE CRANK BY OXYGEN BLAST.

BOOK REVIEWS.

Expense Burden. By A. Hamilton Church. New York. Engineering Magazine. 116 pages. 5¼ x 8 inches. Cloth. Supplied by THE IRON TRADE REVIEW for $1.

This book is a reprint of a series of articles which recently appeared in the *Engineering Magazine*. It is a study of the principles of cost finding in the shops, and treats of the most difficult branches of this general subject, namely, the distribution of the various items of cost, which are grouped under the name "burden," such as rent, insurance, taxes, superintendence, etc. The author criticises severely the old fashioned method of apportioning this indirect expense as a percentage to be added to the wages. He also treats of the "hourly burden," by which is meant the spreading of these indirect charges over the individual jobs according to the number of hours upon which work has been done on them. The author shows that this method may produce quite a different apparent cost of a job than the percentage of wage plan. The third plan discussed is the machine rate method, which he calls exceedingly bad practice, and says it belongs "to the Silurian epoch of shop accounting. It is the ichthyosaurus of expense systems." He states that this method distributes the cost successfully under one set of conditions only, viz., that each machine is never for a moment idle. "This being its condition of maximum perfection, it follows that the greater the proportion of idle hours, the less accurate

will be the results obtained from the method. A little consideration will lead to the conclusion that in a slack time the work done in the shops will be receiving just the same burden as in the busy time with every machine running full. The balance of expenditure not allocated to jobs is lost sight of."

Having paid his respects at length to this "ichthyosaurian system," the author develops what he calls an ideal system, namely, the scientific machine rate and the supplementary rate, the supplementary rate being "the undistributed balance of shop charges due to idleness of productive centers." Briefly stated, this account is thus described: "We charge to a monthly shop-charge account, all charges whatever incurred by that shop including all the items specifically represented in fractional detail by the machines rates. Then as each machine is occupied on jobs, the latter are debited with so much per hour as machine rate, and at the end of the month the total amount so earned by the machines is deducted from the total shop expenses, leaving a balance which is distributed over the same job as a supplementary rate * * * The ratio of the supplementary rate to the amount distributed by the machine rates forms a varying barometer, whose fluctuations is an index to the current efficiency of the shop."

The author's proposed plan is worthy of careful study by those interested in the subject, but we fancy that many objections will be raised to it. It appears to us that the supplementary rate in its variations is not really an index of the current efficiency of the shop but is an index of the condition of business generally, or of the efficiency of the selling department which brings orders into the shop. The efficiency of the shop itself, it seems to us, should be determined, not by an accidental supplementary rate, which may appear in each month, but should be measured by comparing the labor cost for a particular job done on a particular machine at one period in the year with another, the machine itself being charged with the same burden throughout the year. Attempts to charge to the cost of jobs in a particular month a supplementary rate, whose variations are not due to any inefficiency in the shop management but entirely to accidental fluctuations in business outside of the shop, not only introduces great confusion in book-keeping, but may give the management erroneous ideas as to what the real shop efficiency is.

Nevertheless, the author's arguments are worth considering and may afford an opportunity for careful study of this whole problem.

Industrial Canada: A Panoramic View—Report on the Mining and Metallurgical Industries of Canada 1907-8. Published by the department of mines, Ottawa, under the supervision of Dr. Eugene Haanel, director of mines. Size 10 x 6⅝, 144 illustrations, 7 maps, 972 pages. (Price $1, post free.)

Canada is bound to continue in industrial development. Hence this volume is of special interest. The report has been compiled by a staff of expert geologists and mining engineers, who have, as far as possible, investigated every mine and metallurgical industry in the various provinces of the dominion, from the Atlantic to the Pacific. Their respective accounts are not mere inventories, but contain technical descriptions of the character, extent, and equipment of the mines, quarries, metallurgical works and clay industries visited, and reliable statistics of production; as well as a specification of the capitalization, organization, and personnel of the various companies. The magnitude of the work may be gleaned from the fact that the copious index contains the names of some 1,500 industrial concerns. A special feature is that, at the end of each chapter devoted to the respective provinces, appears an up-to-date map, on which are marked the location of all the mines and mineral deposits being worked. The maps alone render this timely volume a valuable acquisition to the desk of every business man interested in Canada. At the present moment, Dr. Eugene Haanel and his son, B. F. Haanel, are in Sweden—under commission of the Dominion government—investigating the commercial side of the electric smelting of iron ores. If their report is optimistic—and the prospect seems assuring—then there will soon be renewed activity in Canada in the vicinity of all the iron ore deposits near to water powers.

Metallurgy. By Henry Wysor. Easton, Pa. Chemical Publishing Co. 6 x 9 inches. 308 pages. Illustrated. Cloth. Supplied by THE IRON TRADE REVIEW for $1.

This book contains much that is of value, despite the fact that it contains many errors. The text naturally divides itself into two parts. The first deals with the general principles underlying the science of metallurgy and the materials used in the arts and industries, the second with the principles of metallurgy as applied to practical ends. Here the author is more at home. His careful and detailed description of processes and finished products have in them a large element of value and the book may serve as the author says in his preface "as a guide to the science of metallurgy." Some of the more important errors are as follows:

In the first chapter, in his treatment of the physical properties of metals, the author states that "Hardness is not a common property of pure metals." Yet hardness is the resistance of a substance to abrasion and characteristic in some degree of all solids.

In the second chapter, he states that "The only mines of graphite in this country of any importance are in New York." At the same time in 1907 nine states and one territory contributed to the grand total of the output, and the state of New York together with that of Pennsylvania, produced approximately only two-thirds of the entire amount.

In the sixth chapter, the author gives in his list of common ores of the metals the chloride of lead, although the lead minerals bearing chlorine are rare, and the secondary mineral, the sulphate of lead, which is of considerable importance, he does not even mention.

In the eighth chapter, the author says that "Goethite is distinguished from limonite only in its water of combination." The former occurs in tabular and prismatic crystals while the latter never crystallizes. In the same chapter again, he places pyrite FeS_2 as a chief ore of iron which in this country plays no part in the metallurgy of that most useful of all metals; and furthermore he makes pyrrhotite of formula Fe_7S_8, separating it from the magnetic sulphides of iron while pyrrhotite includes all the magnetic sulphides ranging from Fe_5S_6 to $Fe_{16}S_{17}$.

In the twenty-sixth chapter the author states that "Gold is only known to occur native and in combination with tellurium." Yet gold occurs in combination with bismuth as bismuth gold carrying 35.5 per cent of bismuth, in combination also with several rare elements and as gold amalgam in combination with mercury containing sometimes as high as 61 per cent of the latter metal.

It is unfortunate that the author went outside of his own field and fell into error. The field of mineralogy seems to lie outside the lines of his research.

A SIGNIFICANT PATENT DECISION.

In connection with the new British patent regulations, the comptroller has recently handed down a decision which is of interest as indicating the strict manner in which the regulations regarding foreign patents apparently are to be enforced. The gist of the current decision is that the manufacture in the United Kingdom of a few parts, which are assembled with a large number of parts manufactured abroad, into a complete machine offered for sale in the United Kingdom, does not constitute "adequate working" of the patent. The decision is of interest to American machinery manufacturers in particular in connection with the question as to the adequacy of manufacture required by the British regulations.

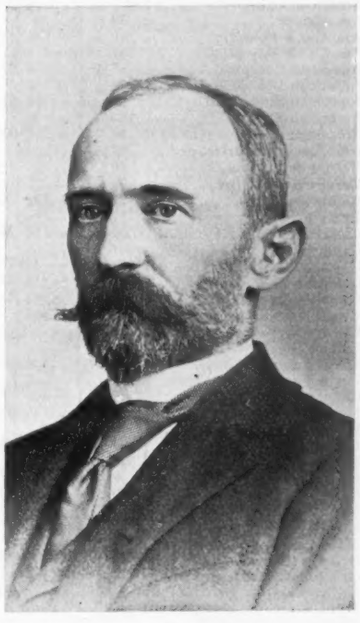
The case arose through an application for the revocation of certain letters patent, granted in 1896 to American interests, for a high speed sewing machine. As imported to England, this machine has been wholly manufactured in the United States, but before selling it, the practice has been to substitute certain parts of British manufacture to meet the particular requirements of the purchaser. These substituted parts, in comparison with the other patented parts of the machine, are few. The application for revocation was made at the instance of interests desiring to sell similar machines of German manufacture in the United Kingdom, where the patentees, it was claimed, enjoyed a monopoly.

The defense of the patentees was that, owing to the absolute necessity of elaborate tools and high-class skilled labor being employed, it would be scarcely possible to manufacture the machine entirely in the United Kingdom. It is made for the patentee by the Brown & Sharpe Mfg. Co., Providence, R. I. It was further claimed that from five to ten years would be required to establish the manufacture of the machine in the United Kingdom.

Under date of Jan. 3, the comptroller general ordered that the patent be revoked forthwith, costs being paid by the patentee. In arriving at this decision, he ruled, first, that "accessories to the machine, manufactured in this country, must be disregarded." On the question of working "to an adequate extent" he held as follows:

"It seems to me impossible to contend that the public demand in this country for the patented article is substantially met by the manufacture here of a comparatively small number of patented parts, which are mere modifications, made to suit the taste and convenience of certain purchasers, for which there would be no demand except for the purpose of using them as parts of the entire machine."

On the question of why there has not been adequate working of the patent, the comptroller remarks that, while it is easy to understand why it has been found more convenient to employ the America maufacturer, the patentee's "own convenience is obviously of itself no satisfactory reason within the meaning of the section." He questions the claim that the entire machine could not be manufactured in the United Kingdom, inasmuch as no steps have been taken "to import into this country the requisite tools and skilled labor." The patent was revoked forthwith, the comptroller ruling that the power to defer revocation for a reasonable period was given to protect "patentees who for their own accord have taken substantial preliminary steps, e. g., by the purchase of sites and the erection of factories, to comply with the requirements of the act; but have had not sufficient time to complete their works and actually manufacture the patented article before an application is made to revoke the patent."



GEORGE W. KINSEY.

The Wichita Supply Co., dealer in machinery, supplies and attachments at Wichita, Kas., has increased its capital to $25,000 from $17,500.

GEORGE W. KINSEY RETIRES.

George Kinsey, who has been manager of sales for the Jones & Laughlin Steel Co. at Cincinnati for the past 20 years, retired from active business on Jan. 1. Mr. Kinsey's health has been poor for some time, and it is his intention to take a rest. He will make a trip south. Boyden Kinsey, a son of George Kinsey, succeeds his father with the title of district sales agent. He has been the head salesman in his father's office for the past 10 years.

Mr. Kinsey was engaged in business in Cincinnati from 1870 to 1900, under the name of George Kinsey & Co., and from 1882 to 1900 had been the selling agent of the Jones & Laughlin Steel Co. in that territory. In 1900 he sold out his business to Jones & Laughlin and became manager of the Cincinnati office of that company. In point of service he was the oldest of the outside managers of the company, and at the annual meetings of the Jones & Laughlin representatives he as "dean" was accorded the seat at the head of the table. He has made no plans for the future, but has determined to stay out of business for at least one year.

Preferred Cost 90 Cents.—A special cash bonus of $19.10 a share on the preferred stock of the United States Steel Corporation sold to employes in 1904 was paid on Jan. 12. Since this issue of stock amounted to 32,516 shares, the total payment was in the neighborhood of $621,000. In the five years in which its employes have been paying for this stock, which was offered to them at $55 a share, an annual dividend of $7 a share, or a total of $35, has been drawn by them and with the $19.10 bonus added, makes their stock cost them only 90 cents a share.

Great Northern Ore Payment.—In accordance with its agreement with the owners, the United States Steel Corporation has made a payment on the Great Northern ore lease to the trustee at St. Paul. As the Steel Corporation has not mined any ore from the Great Northern properties, the full payment fell due Jan. 20. This payment was on the basis of a royalty of 88 cents per ton on 1,500,000 tons for the year 1908, calling for the payment of $1.326,000, equivalent to 0.88 per cent of the ore company's capitalization of $150,000,000.

The Atlas Brass Mfg. Co., Cleveland, has increased its capital to $125,000, from $50,000.

Dullness Throughout Opening Month.

Extreme dullness in the stock market the past week was succeeded by something of a selling movement which seemed characteristic of the entire month of January. The month was something of a disappointment in general business, particularly in the metal trades. The price tendency was consistently downward.

Monday was the dullest day of the year on the New York exchange, but prices held steady. The election of the new chairman of the board of directors of the Crucible Steel Co. put preferred up to 64, the highest price in more than a year. Tuesday the market was irregular, Crucible preferred advancing to 65. Industrial stocks averaged lower Wednesday, and all grades of copper were reduced. Weakness developed Thursday in the entire list and the close was lower. There was moderate activity Friday, but again the close was weak and lower, all grades of copper again being reduced. Harbison-Walker preferred advanced to 85, the highest price ever quoted. Activity and weakness again developed Saturday, prices declining to the lowest of the week.

Money on call was again extremely low, averaging 1½ per cent, and time money was also easy. The actual statement of New York banks for the week showed a decrease in surplus reserve of $12,560,650. The New York law fixed Feb. 1 as the date on which state banks and trust companies would be required to maintain 15 per cent reserve on net deposits, and in preparation for this the reserve on deposits increased $11,723,400. Actual figures of clearing house banks showed loans increased $12,714,100; deposits decreased $1,124,300, and the percentage of reserve, 26.53, against 27.40 the previous week. Non-member banks and trust companies showed loans increased $18,165,300; net deposits increased $25,068,400, and the percentage of reserve 32.7, an increase of 0.7. The Bank of England did not change its discount rate, which remains at 3 per cent, and continued to accumulate gold with the acquiescence of the Bank of France.

The fortnightly railroad bulletin showed that on Jan. 20 the number of idle cars was 21,207 less than on Jan. 6. Commercial failures for the week were 326, compared with 318 the preceding week and 418 the corresponding week last year. In January, for the first time since the panic, the number of immigrants exceeded emigrants by 18,198. Bank clearings showed a decrease of 12 per cent from last week, but a gain of 24.8 per cent over last year. Shares were sold to the number of 3,208,954, compared with 3,356,840 the preceding week, and 2,816,400 the corresponding week last year. Bonds, exclusive of government bonds, were sold to the amount of $37,525,000, compared with $31,141,000 the preceding week and $24,857,000 the corresponding week last year.

Copper Stocks.

New York.—Amalgamated Copper closed 75⅝, a net loss of 4⅞.

Boston.—Butte Coalition closed 22¾, a net loss of 1¼; Calumet & Arizona closed 98, a net loss of 14½; Calumet & Hecla closed 635, a net loss of 20; North Butte Mining closed 72, a net loss of 6⅛; Quincy Mining closed 89½, a net loss of 1½.

Financial Notes.

The Columbus Chain Co. declared the regular quarterly dividend of ½ of 1 per cent on preferred and 3 per cent on common; the Pressed Steel Car Co. the regular quarterly dividend of 1¾ per cent on preferred, payable Feb. 24.

The Central Indiana Fence & Wire Co., Kokomo, Ind., with $10,000 capital stock, has been incorporated to manufacture and sell woven wire fence. The directors are: Casper Butler, Robert W. Butler, Ernest Walton, F. W. Mackie and Dr. Harvey C. Thomas.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Jan. 30	Changes in Week	Date 1909 Ann. M't'g.	Stock Outstanding	Basis	Dividend Last Declared	Dividend Date Last Div. Pay.
Allis-Chalmers	14½	.....	Sept. 2	$19,820,000		.....	.....
Allis-Chalmers pr.	46¾	— ¾		16,150,000	7 cum	1¾ Q.	Feb., 1904
American Can	7⅞	— ⅜	Feb. 2	41,233,300		.....	.....
Am. Can pr.	73	.....		41,233,300	7 cum	1¼ Q.	Jan., 1909
Am. Car & Foundry	48½	—1⅜	June 24	30,000,000		½ Q.	Jan., 1909
Am. Car & Fdy pr.	111	+2		30,000,000	7 n. c.	1¾ Q.	Jan., 1909
American Loc.	55½	—1½	Oct. 19	25,000,000	5	1¼ Q.	Aug., 1908
American Loc. pr.	112¼	+1¼		25,000,000	7 cum	1¾ Q.	Jan., 1909
American Ship	58	— ⅝	Oct. 13	7,600,000	4	1 Q.	June, 1908
American Ship pr.	104⅛	— ⅞		7,900,000	7 n. c.	1¾ Q.	Oct., 1908
Am. Steel Foundries (new).	36	—2½	Dec. 2	17,184,000		.....	.....
Am. Steel Foundries, pr.	47½	.....		17,240,000	6 cum	1	Aug., 1904
Barney & Smith	40	.....	June 1	2,000,000	4	1 Q.	Sept., 1907
Barney & Smith, pr.	95	.....		2,500,000	8 cum	2 Q.	June, 1908
Bethlehem Steel	23¾	—1¾	April 6	14,862,000		.....	.....
Bethlehem Steel, pr.	52	.....		14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	37¾	—1¼	March 16	45,000,000*	6	1¼ S. A.	Feb., 1909
Cambria Iron	46	.....		8,468,000*	4	2 S. A.	Sept., 1908
Chicago Pneumatic Tool	26½	— ¾	Feb. 15	6,145,800	4	1 Q.	Oct., 1907
Colorado Fuel	39	—2½	Oct. 18	34,235,500		3½	April, 1902
Crucible Steel	8⅛	+ ½	Oct. 20	24,578,400		.....	.....
Crucible Steel, pr.	63	+4		24,436,500	7 cum	1 Q.	Dec., 1907
Empire Steel	6	.....	April 27	1,254,770		.....	.....
Empire Steel, pr.	47	.....		2,500,000	6 cum	1¼ S. A.	Jan., 1909
Fay & Egan	90	.....	Feb. 18	1,000,000	6	1¾ Q.	Nov., 1908
Fay & Egan, pr.	100	.....		1,000,000	7 cum	1¾ Q.	Nov., 1908
General Electric	152¼	—3¾	May 11	65,178,800	8	2 Q.	Jan., 1909
Harbison-Walker	18½	.....	Jan. 18	18,000,000		½	Oct., 1907
Harbison-Walker, pr.	85	+3		9,600,000	6 cum	1½ Q.	Jan., 1909
International Pump	38¼	—1⅜	June 8	17,762,500		1	April, 1903
International Pump, pr.	82½	—1¾		11,350,000	6 cum	1½ Q.	Feb., 1909
Lackawanna Steel	43	—2	March 10	34,971,400		.....	.....
Lake Sup. Corp.	16	.....	Oct. 6	40,000,000		.....	.....
New York Air Brake	85	—3	June 17	8,012,500	8	2 Q.	Oct., 1907
Niles-Bement-Pond	97	.....	Feb. 3	8,500,000	6	1½ Q.	Dec., 1908
Niles-Bement-Pond, pr.	100	.....		2,000,000	6 cum	1½ Q.	Nov., 1908
Otis Elevator Co.	50	+3	March 15	6,375,300		1½ S. A.	April, 1908
Otis Elevator Co., pr.	94	+1		6,295,000	6 n. c.	1½ Q.	Jan., 1909
Penn. Steel	50	.....	May 10	10,750,000		.....	.....
Penn. Steel, pr.	104	.....		16,500,000	7 n. c.	3½ S. A.	Nov., 1908
Pittsburg Coal Co.	11⅞	— ⅛	March 9	28,104,600		.....	Nov., 1906
Pittsburg Coal Co., pr.	45½	—2		27,071,800	7 c.	1¾	April, 1905
Pressed Steel Car	40⅝	—2⅛	Feb. 17	12,500,000		3	Aug., 1904
Pressed Steel Car, pr.	101½	— ¾		12,500,000	7 n. c.	1¾ Q.	Feb., 1909
Pullman	169	—3	Nov. 10	100,000,000	8	2 Q.	Feb., 1909
Railway Stl. Spring	46	—1½	March 4	13,500,000	4	1 S. A.	Oct., 1908
Railway Stl. Spring, pr.	101⅛	+ ⅜		13,500,000	7 cum	1¾ Q.	Dec., 1908
Rep. Iron & Steel	24	—1½	Oct. 20	27,191,000		.....	.....
Rep. Iron & Steel, pr.	85¼	—2		20,416,900	7 cum	1¾ Q.	April, 1908
Sloss-Sheffield	76	—2¼	March 10	10,000,000	5	1 Q.	Dec., 1908
Sloss-Sheffield, pr.	109⅞	+ ⅜		6,700,000	7 n. c.	1¾ Q.	Jan., 1909
U. S. Pipe & Fdy.	28	—1⅛	June 23	12,500,000	4	½ O.	Dec., 1907
U. S. Pipe & Fdy., pr.	74	—1¼		12,500,000	7 n. c.	1¾ Q.	Sept., 1908
U. S. Steel	52	—1⅛	April 19	508,302,500	2 n. c.	½ Q.	Mar., 1909
U. S. Steel, pr.	114	— ⅛		360,281,100	7 cum	1¾ Q.	Mar., 1909
U. S. Steel 5s	103⅞	— ⅛		463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	60	—1¼	Sept. 21	9,073,680		.....	.....
Westinghouse Elec.	79⅞	—2⅜	June 16	27,173,200	10	2½ Q.	Oct., 1907
Westinghouse Air Brake	111¼	— ¼	Oct. 5	14,000,000*		2½ Q.	Jan., 1909

Par value of shares, $100, except those sta rred (*), $50.

NEWS FROM MANY INDUSTRIES

New Buyers:—

The Millersburg Furnace Co., Millersburg, O., has been incorporated by Fred H. Finzer, J. B. Randle, J. B. French, and A. L. Grosslin, with $10,000 capital.

The Hodgson Foundry Co., 1215 Association Building, Chicago, foundry and machine shop, has been incorporated with $10,000 capital by John Hodgson, John W. Hodgson and Stephen G. Hodgson.

Robert W. Gladstone, David Gladstone, Henry B. Sharman and others have incorporated the Ontario Metal Culvert Co., with an authorized capital of $55,000, the head office being located at Guelph, Ont.

The Mason Safety Rail Joint Co., Kansas City, Mo., has filed articles of incorporation, with $100,000 authorized capital. The incorporators are: Ben H. Barr, Smith Baker, Howard L. Mason and others.

The Cincinnati Steel Castings Co., Cincinnati has been incorporated with $50,000 capital stock. The incorporators are John L. Hopper, Salmon Jones, John E. Bruce, William Weber and William Gilbert.

The Muck Rake Co., Canton, O., has been chartered with $10,000 capital stock. Harry C. Short, Adam Doyle, John S. Willis, C. L. Booth and W. W. Stephenson are the incorporators. The company will manufacture sheet steel specialties.

The Consolidated Equipment Co., Indianapolis, Ind., with a capital stock of $5,000, has been incorporated to deal in heavy machinery. The incorporators include Earnest W. Abbott, Viola H. Abbott and John H. King.

The Oklahoma Stove & Structural Iron Co., Oklahoma City, has been chartered with $75,000 capital stock. The directors are: William H. Mathias, William F. Bush, Davis L. Myers, John H. Meyers, Charles H. Adkins, all of Oklahoma City.

The Atlas Packing Co., of New York City, has been incorporated to manufacture and deal in metallic packing, with $20,000 capital stock. The incorporators are Fred Lauer, Upper Montclair, N. J.; Hudson Dickerman, 168 Center street; George K. Louden, 503 Fifth avenue, both of New York, and R. G. Davey, of White Plains, N. Y

The Blair Port Co., New York City, has been granted a certificate of incorporation to manufacture iron and steel, with a capital of $100,000. The incorporators are George C. Beach, 225 West End avenue; H. A. Cushing, 127 West Fifty-eighth street, and Rutgers B. Miller, 45 East Twentieth street, all of New York City.

The Great Lakes Pattern Co., Cleveland, capitalized at $10,000, has been chartered by Daniel Cameron, Allen G. T. Schmidt, John L. Lake, Frederick Watkin and William J. Hunt.

The Martin Pump & Machine Co., Ltd., of Toronto, has been incorporated with $40,000 capital stock, the provisional directors being Thomas H. Martin, James Martin and Mary M. Thompson.

The B. M. Osbun Co., First National Bank Building, Chicago, to manufacture machinery, tools and patented articles, with $2,500 capital stock, has been incorporated by Clayton R. Taylor, Thomas G. Deering and William M. Klein.

The Dakota Iron Co., Duluth, Minn., has filed articles of incorporation with $100,000 capital stock through John H. Hill, Duluth; Edwin A. Lamb, Washburn, N. Dak., and H. R. Turner, Fargo, N. Dak.

The Landgraf Machine Co., Mishawaka, Ind., with a capital stock of $10,000, has been granted a charter to manufacture and repair tools. The incorporators are John P. Landgraf, William A. Cook and Amanda M. Cook.

The Piper-Rust Co., Birmingham Ala., has filed articles of incorporation, with a capital of $12,000. The officers are: President, C. E. Piper; vice president, S. M. Rust; secretary, E. J. Lee Rust; treasurer, E. M. Rust.

Articles of incorporation have been filed by the Chicago Metal Supply Co., 100 Washington street, Chicago, to manufacture anti-friction and babbitt metals, with a capital of $10,000. The incorporators are: E. F. Parr, L. I. Sorup, and A. D. Mackay.

The Central Railway Equipment Co., Canton, O., with a capital stock of $100,000, has been incorporated by Armstrong Ashbrook, Andrew Hollinger, Luther Day, W. W. Stephens and L. Dailey.

The Atlas Mfg. & Stamping Co., St. Louis, Mo., has been granted a charter to manufacture and deal in galvanized iron, tin, laundry machinery, etc., with $50,000 capital stock fully paid. Those interested include F. M. Wilcox, P. M. Wilcox and August Walz Jr.

The Montgomery & Cannelton Bridge Co., Montgomery, W. Va., capitalized at $50,000, has these incorporators: W. E. Beardslee, Clarksburg, W. Va., W. N. Conger, Oswego, N. Y., Walter C. Hardy, Charleston, W. Va., O. J. Henderson and M. J. Simms of Montgomery.

The Boston Toggle Co., Boston, to deal in machinery, tools, etc., with $250,000 capital stock, has been incorporated, with the following officers: President, James R. Flanagan; treasurer, George F. Moulton; clerk, James D. McQuaid, all of No. 17 Milk street, Boston.

Articles of incorporation have been filed by the Insley Mfg. Co., Indianapolis, Ind., which has a capital of $10,000, to manufacture iron bridges and ornamental structural iron work. The directors are Ernest F. Kneffler, William H. Insley and Ferdinand L. Pfeiffer.

The Eberman Auto Appliance Co., 1203 Monadnock Block, Chicago, to manufacture tools, machinery and vehicles, has been granted a certificate of incorporation, with $15.000 capital stock. The incorporators are: J. W. Eberman, Edward F. Wilson and William A. Eberman.

New Construction:—

The American Iron Roofing Co., Elyria, O., has secured the contract for roofing the new finishing department of the Elyria Iron & Steel Co.

Stockholders of the James F. Powers Foundry Co., Elkton, Md., at their meeting Feb. 5, will take final action respecting an addition to the steel casting plant.

The Columbus Machine & Foundry Co., Columbus, Miss., has completed repairs to its plant recently damaged by fire, and has placed it again in operation.

The York Mfg. Co. has broken ground for the construction of a machine shop on West Philadelphia street, York, Pa., three stories high, the floors to be of concrete construction.

The Waterloo Gasoline Engine Co, Waterloo, Ia., has acquired a piece of ground adjoining its foundry, 75 x 140 feet, upon which it will build an addition in the near future. The addition is made imperative by the restricted quarters of the company at the present time.

Holm's Machine Mfg. Co., Sparta, Mich., whose incorporation was noted some time since, advises that it is building a complete plant, including foundry, pattern shop and machine shop, for the manufacture of a full line of gasoline engines, marine, farm

and automobile. All contracts for the buildings have been let, and the company is now buying its iron working machinery and foundry supplies. It expects to be in operation by April 15, and to manufacture from 10,000 to 15,000 engines per annum.

General Industrial:—

The Brookside Brass & Foundry Mfg. Co., Cleveland, has increased its capital stock from $10,000 to $20,000.

The Cutler-Hammer Co., Milwaukee, has filed an amendment increasing its capital to $1,100,000 from $1,000,000.

The Mitchell Motor Car Co., Racine, Wis., has filed a charter of amendment increasing its capital stock from $500,000 to $1,100,000.

Ellsworth E. Chapman, 554 West street, Spokane, Wash., has perfected a patent device for starting freight cars and is considering a proposition for manufacturing the device.

The annual meeting of the Champion Iron Co., Kenton, O., was held Jan. 4, when the reports submitted by the officers for the year 1908 showed that the business for that period had been successful and profitable. These officers were elected: President and treasurer, G. J. Carter; vice president, W. Armstrong; and secretary, G. D. Carter.

At the annual meeting of the stockholders of the Waterloo Gasoline Engine Co., Waterloo, Ia., it was decided to increase the capital stock from $100,000 to $200,000, to provide for improvements to the machine shop and foundry. When the improvements are completed, the works will have a capacity of 50 engines a day. The officers elected at this meeting were: President, George B. Miller; vice president, G. W. Witry; secretary and treasurer, J. E. Johnson.

The employes of the Ornamental Iron Works Co., Akron, O., were voted 10 per cent of the profits at the recent annual meeting, at which these officers were re-elected: President and general manager, Fred Zindel; vice president, H. L. Brandau; secretary and treasurer, W. A. Boestche. The capital stock was increased from $10,000 to $25,000. The company will soon begin the manufacture of a patent metal bottom board for use in foundries which may necessitate an addition to the plant.

The International Roturbine Engine Co. of America, which was recently incorporated under the laws of Arizona, has located in Fargo, N. Dak. The incorporators include William H. Thompson Jr., who is applying for patent rights on a rotary steam engine which he has designed; George A. Ice, Julius M. Lee and Robert P. Norton, all of St. Thomas, N. Dak. It is probable that a Fargo foundry will do the work for the company for the present. The engine as designed calls for four cylinders at right angles to each other about the shaft, all worked by one eccentric and fed with steam through the hollow revolving shaft.

The properties of the Norwalk Steel & Iron Co. and the William Kavanaugh Co., Norwalk, O., have been sold by the trustee in bankruptcy to the Huron Steel & Iron Co., of Norwalk, for $166,800. The sale was effected by an agreement of 96 per cent of the creditors of the two bankrupt companies. A reorganization of the American Steel & Iron, which has been operating the two plants for a year, has taken place under the name of the Huron Iron & Steel Co., the change of name being a legal formality necessary to quiet the title.

At the annual meeting of the stockholders of the Crane Co., Chicago, the following officers and directors were elected: President, R. T. Crane; first vice president, C. R. Crane; second vice president, R. T. Crane Jr.; third vice president, R. T. Crane III; secretary, A. F. Benner; assistant secretary, J. B. Berryman; treasurer, A. D. MacGill; assistant treasurer, R. B. Stiles; C. A. Olson, J. C. Kilgore and W. W. Doolittle. Following last year's representation on the board of directors of three generations of the Crane family, this year, with the addition of R. T. Crane III, son of C. R. Crane, three generations also appear as officials of the company.

The reorganized Salamanca Engine Iron Co., Salamanca, N. Y., is planning to engage in the manufacture of automobile sundries, including an automatic air pump attached to automobiles. A. S. Kenwood, of Pittsburg, who is general manager of the reorganized engine company, has acquired inventors' rights to the pump. The pump itself weighs only six pounds, and a 3½-inch tire can be pumped in 30 seconds. The pump is operated by a friction wheel, by which the automobilist can make his engine do the work. The company has just booked an order under which 1,000 pumps monthly are to be delivered, beginning with the month of March.

The Vulcan Furnace Co., Utica, N. Y., whose incorporation with a capital stock of $20,000 was recently noted, has organized to manufacture stoking devices for stoking boilers automatically. The directors of the company are: DeWitt H. Palmer, Buffalo; Sanford F. Sherman, New Hartford, N. Y.; Edward F. Cookinham and Joseph E. Batchelder, of Beloit, Wis. The directors recently organized by the election of Mr. Sherman, president; Mr. Palmer, vice president, general manager and treasurer, and Mr. Cookinham, secretary. The announcement is made that the first of the stokers will be manufactured at the plant of the Utica Industrial Co., Rome, N. Y.

Trade Notes:—

The Zeman Iron Works Co, structural and ornamental iron work, has changed its title to the Cleveland Iron Works Co., with offices and factory at 6824 Union avenue, Cleveland, O.

The McClintic-Marshall Construction Co., designer, manufacturer of steel buildings, bridges, etc., Pittsburg, Pa., has opened an office at 839 Central building, Seattle, Wash., with C. F. Boyce as sales representative in charge.

The Thomas Steel Co., W. A. Thomas, president; C. G. Thomas, vice president and treasurer, and C. R. Thomas, secretary, announces that it has taken over the interests of the Niles Steel Co., and the Niles Corrugating Co., with general offices at Niles, O.

Ladd & Baker, Inc., announce that they are the successors to the engineering offices, etc., of James B. Ladd, M. E., consulting engineer, and David Baker, consulting and metallurgical engineer, and of Ladd & Baker, consulting engineer, and will carry on a general consulting and contracting engineering business in the Real Estate Trust building, Philadelphia. The officers are: President, James B. Ladd; vice president, David Baker; treasurer, Francis Easby.

The Metal Mfg. Co. is a new concern which has begun business, metal and alloys, and foundry facings, at 1826 Land Title building, Philadelphia.

Fires:—

The Buffalo Union Furnace Co., Buffalo, suffered a loss of about $4,000 at its plant recently.

The loss on the machine shop of A. C. Elder, Watkinsville, Ga., is placed at $5,000.

The Riverside Iron Works, Kansas City, Mo., suffered a loss on buildings and contents, of $14,000, Jan. 24, fully covered by insurance.

The plant of the Weber Gas & Gasoline Engine Co., Kansas City, Mo., was damaged severely Jan. 22, the loss being placed at about $12,000.

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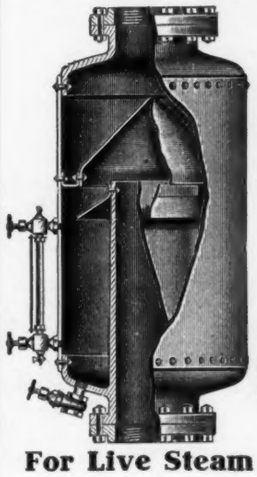

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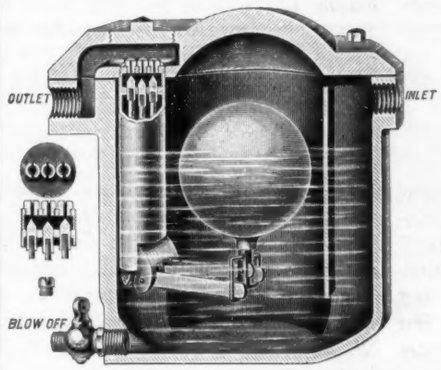

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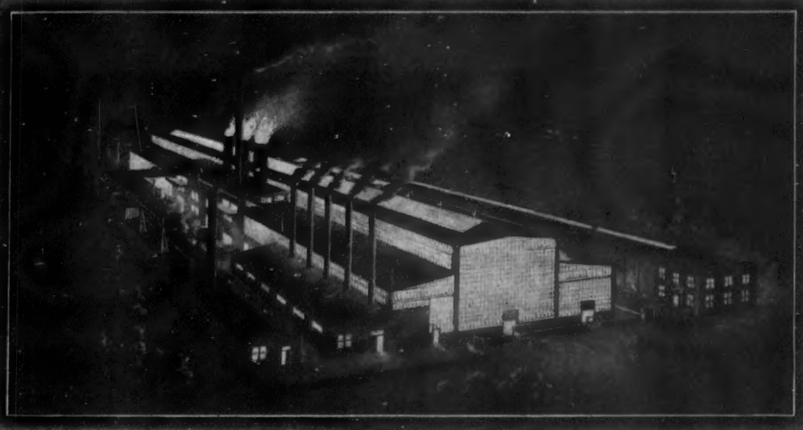

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Interstate Iron & Steel Co., Chicago.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
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Lockhart Iron & Steel Co., Pittsburg, Pa.
North Works, Chicago, Ill.
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Republic Iron & Steel Co., Pittsburg, Pa.
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Peck, Francis J., & Co., Cleveland, O.

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North Works, Chicago, Ill.
Milton Mfg. Co., Milton, Pa.

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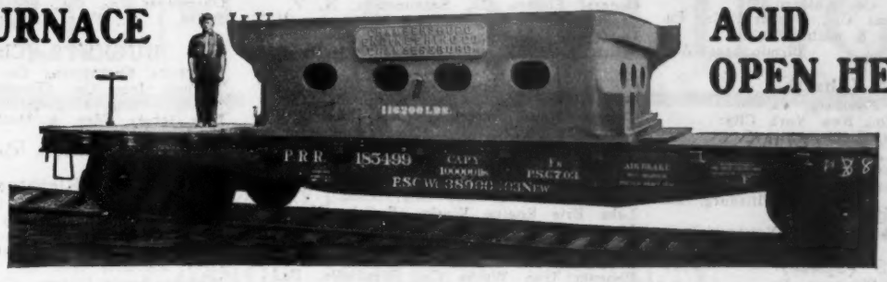

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Stowe-Fuller Co., Cleveland, O.
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Youngstown Car Mfg. Co., Youngstown, O.

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Chase Foundry & Mfg. Co., Columbus, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Charging).

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Coal, Coke and Mining).

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Massillon Fdry. & Machine Co., Massillon, O.
Wiener Co., Ernst, New York, N. Y.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Derrick).

Byers, John F., Machine Co., Ravenna, O.

CARS (Electrically Driven).

Atlas Car Mfg. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Westinghouse Machine Co., E. Pittsburg, Pa.

CARS (Industrial).

Atlas Car Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Wiener Co., Ernst, New York, N. Y.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Tank).

Meehan Boiler & Construction Co., Lowellville, O.
Standard Boiler & Plate Iron Co., Niles, O.

CASTINGS (Auto).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Canton Brass Co., Canton, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Ideal Bronze Co., Cleveland, O.
Ohio Malleable Iron Co., Columbus, O.
Walker Foundry Co., Erie, Pa.

CASTINGS (Brass, Bronze and Aluminum).

Canton Brass Co., Canton, O.
Dake Engine Co., Grand Haven, Mich.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Farrar & Trefts, Buffalo, N. Y.
Ideal Bronze Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.
United Engineering & Foundry Co., Pittsburg, Pa.

IRON CASTINGS

Large Modern Foundry, with capacity sufficient for very prompt delivery of any order.

LARGE WORK A SPECIALTY.

Semi-Steel Castings

AND

Machine Moulded Gears

SEND FOR OUR GEAR LIST.

Farrel Foundry & Machine Company,
ANSONIA, CONN.

CASTINGS

Iron and Semi-Steel

HEAVY MACHINERY CASTINGS
Up to 25 tons in weight
SEMI-STEEL CASTINGS guaranteed over 30,000 lbs. tensile strength
SMALLER CASTINGS made on molding machines at low prices

BIRMINGHAM IRON FOUNDRY
Derby, Conn.

ROSS-MEEHAN FOUNDRY CO.
Chattanooga, Tenn.
Grey & Malleable Iron Founders

CASTINGS
1 ounce to 50,000 pounds

Railroad & Warehouse Stoves.
A full line of M. C. B. Standard Patterns.

Blast Furnace CASTINGS

—and—

ROLLING MILL MACHINERY

Estimates furnished promptly.

BRADDOCK MACHINE & MFG. CO.
Braddock, Pa.

Light Grey Iron
CASTINGS

Finished in any manner.

Plain Annealed Machined
Plated Painted Japanned

Brass Pattern Work a Specialty.

HUBLEY MANUFACTURING CO.
Lancaster, Pa.

CASTINGS (Crucible Steel).
Chicago Steel Foundry Co., Chicago, Ill.
Lebanon Steel Castings Co., Lebanon, Pa.
Oostburg Steel Foundry, Oostburg, Wis.
Prime Steel Co., Milwaukee, Wis.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS (Die).
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS (Galvanized).
Cleveland Galvanizing Works Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.

CASTINGS (Gray Iron).
Alliance Foundry Co., Canton, O.
American Bridge Co., New York City.
American Roll & Fdy. Co., Canton, O.
Barlow Foundry Co., Newark, N. J.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Birmingham Iron Foundry, Derby, Conn.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dake Engine Co., Grand Haven, Mich.
East Buffalo Iron Works, Buffalo, N. Y.
Farrar & Trefts, Buffalo, N. Y.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Green Engineering Co., Chicago, Ill.
Hubley Mfg. Co., Lancaster, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Marshall Foundry Co., Pittsburg, Pa.
Massillon Fdry. & Machine Co., Massillon, O.
McLanahan-Stone Machine Co., Hollidaysburg.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Shelby Foundry Co., Shelby, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Taylor & Boggis Foundry Co., Cleveland, O.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Foundry Co., Pittsburg, Pa.
United States Cast Iron Pipe & Foundry Co., New York City.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Car Mfg. Co., Youngstown, O.
Youngstown Fdy. & Mach. Co., Youngstown, O.

CASTINGS (Gray Iron, Car and Locomotive.)
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
East Buffalo Iron Works, Buffalo, N. Y.
Farrar & Trefts, Buffalo, N. Y.
Hubley Mfg. Co., Lancaster, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS (Gray Iron Machinery).
Taylor & Boggis Foundry Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS (Light Gray Iron).
Taylor & Boggis Foundry Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.

CASTINGS (Malleable).
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Albion Malleable Iron Co., Albion, Mich.
Barlow Foundry Co., Newark, N. J.
Chisholm & Moore Mfg. Co., Cleveland, O.
Dayton Malleable Iron Co., Dayton, O.
Erie Malleable Iron Co., Erie, Pa.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Galesburg Mall. Castings Co., Galesburg, Ill.
Globe Malleable Iron Co., Syracuse, N. Y.
Grand Rapids Malleable Works, Grand Rapids, Mich.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Meeker Foundry Co., Newark, N. J.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Northern Malleable Iron Co., St. Paul, Minn.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
Union Malleable Iron Co., East Moline, Ill.
West Virginia Malleable Iron Co., Point Pleasant, W. Va.
Wisconsin Malleable Iron Co., Milwaukee, Wis.

CASTINGS (Malleable, Car and Locomotive).
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Albion Malleable Iron Co., Albion, Mich.
Dayton Malleable Iron Co., Dayton, O.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Union Malleable Iron Co., East Moline, Ill.

CASTINGS (Semi-Steel).
Birmingham Iron Foundry, Derby, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Walker Foundry Co., Erie, Pa.

CASTINGS (Steel).
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Evans, David, & Co., Chicago, Ill.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Lebanon Steel Castings Co., Lebanon, Pa.
Massachusetts Steel Casting Co., Everett, Mass.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Oostburg Steel Foundry, Oostburg, Wis.
Otis Steel Co., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Prime Steel Co., Milwaukee, Wis.
Riverside Steel Casting Co., Newark, N. J.
Sharon Foundry Co., Sharon, Pa.
Solid Steel Casting Co., Chester, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel & Iron Casting Co., Cleveland, O.
Youngstown Fdy. & Mach. Co., Youngstown, O.

CASTINGS (Steel, Electrical.)
Lebanon Steel Castings Co., Lebanon, P.
Strong Steel Foundry Co., Buffalo, N. Y.
West Steel & Iron Casting Co., Cleveland, O.

CASTINGS (Steel, Car and Locomotive).
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Lebanon Steel Castings Co., Lebanon, P.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Cleveland, O.
Prime Steel Co., Milwaukee, Wis.
Pratt & Letchworth Co., Buffalo, N. Y.
Riverside Steel Casting Co., Newark, N. J.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel & Iron Casting Co., Cleveland, O.

CASTINGS (Stove Plate).
Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS (Vanadium).
Mesta Machine Co., Pittsburg, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

CEMENT
American Refractories Co., Chicago, Ill.
Universal Portland Cement Co., Chicago, Ill.

CHAINS.
Bassett-Presley Co., Cleveland, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Meeker Foundry Co., Newark, N. J.

CHAPLETS.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHARCOAL.
Hillman, J. H., & Son, Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHEMISTS (Analytical).
Emmerton, F. A., Cleveland, O.
Peck, Francis J., & Co., Cleveland, O.

CHEMISTS (Manufacturing).
Grasselli Chemical Co., Cleveland, O.

CHISELS (Cold).
Anderson Forge & Machine Co., Detroit, Mich.

CLUTCHES.
Brown Hoisting Machinery Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Dodge Mfg. Co., Mishawaka, Ind.
Farrar & Trefts, Buffalo, N. Y.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Schultz, A. L., & Son, Chicago, Ill.

CLUTCHES (Induction.)
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

COAL AND COKE.
Baird & West, Detroit, Mich.
Bessemer Coke Co., Pittsburg, Pa.
Blair, Reed F., & Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Columbus Iron & Steel Co., Columbus, O.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Debevoise, Anderson & Co., New York City.
Hammond-Byrd Co., Birmingham, Ala.
Hanna, M. A., & Co., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
Hillman, J. H., & Son, Pittsburg, Pa.
Jamison Coal & Coke Co., Pittsburg, Pa.
La Belle Iron Works Co., Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mudge & Co., Edmund W., Pittsburg, Pa.
Pittsburg & Ohio Mining Co., Cleveland, O.
Rogers, Brown & Co., Cincinnati, O.
Shanklin, Jas. R., & Co., Cincinnati, O.
Stewart Iron Co., Ltd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Walter-Wallingford & Co., Cincinnati, O.
Washington Coal & Coke Co., Pittsburg, Pa.

COCKS (Gage).
Chaplin Fulton Mfg. Co., Pittsburg, Pa.
Jenkins Bros., New York City.
Wright Mfg. Co., Detroit, Mich.

COILS (Pipe).
Green Fuel Economizer Co., Matteawan, N. Y.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.

COLUMNS (Water).
Wright Mfg. Co., Detroit, Mich.

COLUMNS (Water Alarm).
Wright Mfg. Co., Detroit, Mich.

COMPOUND (Core).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

COMPRESSORS (Air).
American Air Compressor Works, New York City.
Baird Machinery Co., Pittsburg, Pa.
Bury Compressor Co., Erie, Pa.
Cameron, A. S., Steam Pump Works, New York City.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Deming Bros., Salem, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
McGowan, John H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.
Scully Steel & Iron Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wickes Bros., Pittsburg.
Wisconsin Engine Co., Corliss, Wis.

COMPRESSORS (Gas).
Bury Compressor Co., Erie, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.